CHAPTER 1 - INTRODUCTION

This document identifies and describes the physical, biological, and human features of Mahogany Creek Watershed. This is a dynamic document subject to change as new information becomes available and data is collected.

A multiple discipline team of resource specialists gathered and analyzed data and information currently available. The team developed issues, researched historic and current conditions, determined trends within the watershed, developed desired future conditions (dfc) and recommendations to achieve those dfcs. The analysis was completed during winter 1999, 2000.

General Description

Mahogany Creek Watershed is located on the Teton Basin Ranger District of the Targhee National Forest along the east side of the Big Hole Mountains and the north side of the Snake River Mountain Range. The watershed includes all of the waters that drain into the Teton River from Teton Pass Highway west to Pine Creek Pass and north to Grandview Point. The analysis area is not a true watershed, but a composite watershed. A true watershed is a fully contained geomorphic unit flowing to a common point (usually the confluence with a larger stream). A composite watershed is a series of smaller watersheds that are grouped together but do not form a "closed system" draining to a common point.

The analysis area (42,967 acres) includes all of the National Forest lands, private lands within the National Forest boundary and adjacent Bureau of Land Management (BLM) lands.(See Map 17) Within the analysis area, 1,824 acres are privately owned and 300 acres are managed by BLM; the Forest Service manages approximately 40,843 acres within the analysis area. Land uses on the private lands immediately adjacent to the analysis area are housing developments, ranches and a golf course in the development stages. The adjacent lands will be included in the analysis in general terms because less information was available at the time of the analysis and they impact the resources in the analysis area.

Portions of Garns Mountain (19,527 acres) and Palisades (6,302 acres) Roadless Areas are included in the watershed. No new road construction or timber sales (except for stewardship purposes) are allowed with in these areas. This is important in terms of management options. See Map 3 for roadless area locations.

The Revised Forest Plan subdivides the Forest into management prescription areas that have specific goals, objectives standards and guidelines. The management prescription areas located within this watershed are Visual Quality Maintenance (2.1.1), Elk and Deer Winter Range (2.7 a), Semi-Primitive Motorized (3.2j,i), Timber Management No Clearcut (5.1.3b), Timber Management Big Game (5.1.4b) and Concentrated Development Areas (8.1). The prescription areas determine management options. See Map 4 for location.

The resource areas discussed in the following chapters are as follows. The amount of detail analyzed for each resource was based on the issues listed in the following chapter. A resource that was a component of the watershed but not a main issue was not analyzed in great detail.

Physical Resources

Geology/Soils
Hydrology

Biological Resources

Vegetation
Wildlife
Fish

Social Resources

Cultural
Recreation
Transportation System
Economics

CHAPTER 2 – ISSUES AND KEY QUESTIONS

Issues and key questions were developed to focus the analysis on specific concerns in the watershed. Indicators were developed for the issues to direct and quantify the analysis. Issues were gathered from the public during a public meeting held on January 4, 2000, through discussions with interested parties, resource specialists knowledge of the area and Line Officer's purpose for the analysis. The main issues are:

- Water quality and watershed improvements
- Cutthroat trout habitat improvements
- Change in vegetation disturbance regimes
- Big game winter range
- Canada lynx
- Management of roads and trails

In addition to the resources covered under the issues, other resource areas were documented in less detail to provide background and an overall picture of the watershed.

Issue: Water quality specifically sedimentation and stream function has been affected by construction and use of roads and trails, grazing, decrease in beaver populations, mine tailings and introduction of non-native plant species.

Key Questions: How have human disturbances affected water quality?
Are the streams and riparian zones resilient and functioning properly?
What are the effects and extent of mine tailings?
How have natural occurrences affected water quality? What are those occurrences?
Are the plant populations within their natural range of variability?
What is the status of beaver?

Indicators: Miles of roads and trails within riparian corridors
Trend in beaver populations
Stream characteristics
Location and content of mine tailings
Trend in plant species – native versus non-native

Issue: Introduction of exotic fish species, removal of corridors and de-watering of streams has decreased the native fish populations.

Key Questions: Has the introduction of exotic fish species lead to the decline of native fish species and how?
Where are the points of stream diversions and how has this affected native fish populations?
Are the streams and creeks connected to Teton River and where?

Indicators: Trend in cutthroat and brook trout populations

Issue: Vegetative structure, composition and function have been altered due to human activities such as fire suppression, grazing, development and logging.

Key Questions: What are the main vegetation types?
What are the disturbance regimes?
How has interruption of natural disturbance processes affected structure, composition and function of vegetative species?
How have vegetation patterns changed over time across the landscape and what caused those changes?
Are there noxious weeds and exotic plant species in the analysis area and where are they?

Indicators: Acres and distribution of vegetative types and age classes
Patch size
Fire regimes
Insect and disease regimes
Acres logged and logging method
Grazing trends

Issue: Past trapping and habitat alteration (roads, logging, fire suppression, grazing) has decreased lynx populations.

Key Questions: What is the status of lynx in the watershed?
What and where is lynx habitat?
How have human activities affected lynx populations and habitat?
How have changes in vegetation types, patterns and structure affected lynx?

Indicators: Acres of denning and foraging habitat
Affects of human access on movement corridors, denning habitat, competition with other predators.

Issue: Increased access, development and change in vegetation have decreased big game winter range and caused disturbance and displacement of these animals.

Key Questions: How has increased year round human access, development on private lands and motorized access affected the availability and use of critical big game winter range?
How has recreation use (roads, atv, hunting) affected wildlife?
What is the condition of winter range?

Indicators: Acres of big game winter range
Trends in vegetation composition, pattern and structure
Trends in recreational use on winter range

Issue: An increasing and diverse local, regional, national population has demanded a variety of recreational experiences changing recreational use in the Big Holes.

Key Questions: What are the current and predicted recreational uses?

Are trails and roads adequate to meet current and future recreation needs?

Indicators: Number of user days
Number of outfitter permits and applications
Trail and road condition and stability
Types of recreation use

CHAPTER 3 – REFERENCE AND CURRENT CONDITION

Reference and current conditions were researched for all resources known to occur in the watershed using available literature, forest specialist's knowledge and anecdotal information. Timeframes for reference and current conditions vary by resource depending on European settler influence.

SOILS

The timeframes selected for reference conditions for soils are prior to 1840 for riparian soils and prior to 1880 for all other soils. The near elimination of beaver by trappers by 1840 greatly influenced riparian conditions. Permanent European settlers arrived later (1880) and began to harvest timber, graze livestock and suppress fires.

Not much information exists on the types of soils present during reference conditions. There have been events in recent history that have changed the soils. Most of the information relates to current conditions of the soils and events leading to these conditions.

The following soils information is taken from the Targhee National Forest Ecological Unit Inventory (Bowerman 1999). The acres represent those found in the watershed. See Map XX for locations of the Ecological Units.

Table 3-1 EUI

Ecological Unit Number and (acres)	Dominant Slopes	Current Vegetation	Management Limitations	Dominant Soils
1106 (819ac)	40-70%	Sage grass, open canopy Douglas fir	Steep slopes limit use of heavy equipment. Steep slopes also limit re-vegetating cut and fill slopes.	Deep to very deep calcareous soils with high % gravels and cobbles
1130 (185ac)	4-30%	Short sod forming grasses and sedges	Off-road vehicle use limited due to highly erodible soils. Fencing is severely limited due to rocky soils. Re-vegetation limited due to short growing seasons and rocky, droughty soils	Very deep calcareous soils with high % gravels and cobbles
1170 (154ac)	4-35%	Subalpine fir/gooseberry and tall forbs	High potential for mass movement High potential for avalanches. Off-road vehicle use is severely limited due to easily eroded soils. Use of heavy equipment for woodland harvest is severely limited due to slope and boulders	Very deep loamy soils with a deep layer of heavy clay and low % coarse fragments

Ecological Unit Number and (acres)	Dominant Slopes	Current Vegetation	Management Limitations	Dominant Soils
1175 (39ac)	35-60%	Tall forbs	High potential for mass movement High potential for avalanches Off-road vehicle use is severely limited due to easily eroded soils. Use of heavy equipment for woodland harvest is severely limited due to slope	Very deep loamy soils with a deep layer of heavy clay and moderate % of gravels and cobbles
1216 (7562ac)	35-60%	Subalpine fir /Rocky Mountain maple	High potential for mass movement High potential for avalanches Revegetating cut and fill slopes is severely limited due to steep slopes. Use of heavy equipment for woodland harvest is severely limited due to steep slopes.	Very deep sandy loam soils with a high % of stones, cobbles and gravel. Old volcanic ash on surface.
1315 (19,437ac)	15-50%	Quaking aspen, Subalpine fir/sweetcicely, Douglas fir/ snowberry, Subalpine fir/blue huckleberry, mountain shrub	Moderate potential for mass movement Use of heavy equipment for woodland harvest is severely limited due to slope	Very deep silt loam to loam to sandy loam soils with high % of gravels and cobbles
1316 (4146ac)	40-70%	Subalpine fir/blue huckleberry, Subalpine fir/western meadowrue, mountain shrub and tall forb in avalanche chutes	High potential for mass movement High potential for avalanches Re-vegetating cut and fill slopes is severely limited due to steep slopes. Use of heavy equipment for woodland harvest is severely limited due to steep slopes. Fencing is severely limited due to rocky soils Foot and saddle stock trails are limited because of slope and rock outcrops.	Very deep silt loam to loam to sandy loam soils with high % of gravels and cobbles. Small areas of rock outcrop and associated shallow soils as well.
1595 (1458ac)	10-30%	Lodgepole pine/ blue huckleberry, Douglas fir/pinegrass	Use of heavy equipment for woodland harvest is severely limited because the soils erode easily. Fencing is severely limited due to rocky soils.	Very deep silt loam to sandy loam soils with a high % of gravels and cobbles. Old volcanic ash on the surfaces.

Ecological Unit Number and (acres)	Dominant Slopes	Current Vegetation	Management Limitations	Dominant Soils
1646 (204ac)	15-50%	Douglas fir/snowberry, subalpine fir/blue huckleberry, Douglas fir/blue huckleberry	High potential for mass movement. Off-road vehicle use is severely limited because soils erode easily and compact easily. Use of heavy equipment for woodland harvest is severely limited on the sideslopes of low escarpments and incised drainageways because of steep slopes. Unsurfaced roads and parking areas are severely limited because of steep slopes.	Very deep silt loam soils with some coarser deep layers and high % of gravels and cobbles. Old volcanic ash on the surfaces.
2606 (206ac)	0-6%	Booth's willow/fowl bluegrass, Geyer's willow/fowl bluegrass, shrubby cinquefoil/Kentucky bluegrass, inclusions of upland shrub/grass	Dynamic riparian systems. Vegetation, beaver activity, depth to seasonal high water table, channel incisement and stream flow regime interrelate with each other. When stream channels become incised the water table drops below the major rooting zone and the vegetation shifts toward upland communities. Fencing, unsurfaced roads, and parking areas are severely limited because of wetness and flooding.	Very deep silt loam to sandy loam soils with a high % of gravels deep. These soils are frequently flooded and poorly drained.

Events have changed the soil conditions from what they were historically. The following summaries are derived from on site visits, applicable literature and Forest Service files.

Hydrologic disturbance for the watershed is between three and four percent. Hydrologically disturbed condition is based on changes in natural canopy cover (vegetation removal) or a change in surface soil characteristics (compaction) that may alter natural streamflow quantities and character (RFP page G-20). Hydrologic disturbance is a standard in the Revised Forest Plan.

Landslides have been occurring as a natural disturbance in the analysis area since before the reference period. Nearly 1300 acres of landslides have been mapped in Watershed 22. Concentrations of slides are found on the South Fork of Packsaddle Creek, North Fork of Horseshoe Creek and the south facing slopes of the North Fork of Mahogany Creek. The landslides range from 4 to 330 acres in size. Current road and trail routes fall on the toe-slopes of at least 12 slides in these drainages.

Coal mining occurred in the watershed. Since 1903 approximately 100,000 tons of excellent quality coal has been produced from this district. The character of the coal is described as sub-bituminous to high grade bituminous that is low in sulphur, ash, and moisture. The district is confined to Section 6, T.4N., R.44E.; Sections 24, 25 and 26, T.5N. R.43E, and Sections 19, 28, 29, 30, 31 and 32, T.5N., R.44 E. Four of seven beds of the Frontier formation, the Brown Bear, Progressive, Blacksmith and Boise were developed. Five holdings were described in a 1951 report. See Map 7 for locations.

- Grand Teton Coal Company which owned approximately 1080 patented acres in Sections 24, 25, 36 T.5N.,R.43E.; Section 31 T.5N, R.44E.; Section 6, T.4N, R.44E. ; and Section 1, T.4N., R.43. Included in these tracts are such formerly independent mines as the Horseshoe, Bellcut, Brown Bear and Boise.
- Mikesell Mine on the south side of Packsaddle creek in the NW1/4 Section 19, T.5N., R.44E.
- Idaho Mine found near the top of the ridge in the SW1/4NE1/4 Section 30, T.5N., R.44E.
- Pintar Mine on Packsaddle Creek in the SW1/4 Section 24, T.5N. ,R.43E.
- Superior Mining Company that had a prospecting permit on 24,000 acres in the Superior Creek Area immediately south of the Teton Coal Company's holdings. (Kiilsgaard 1951)

Unstabilized spoil dumps and remains of a load-out facility are still found near the confluence of Hillman Creek and the North Fork of Horseshoe Creek.

Extensive **roads and trails** did not exist prior to European settlement. The soils under roads and trails are essentially removed from the productive soils base.

Livestock grazing between 1900 and 1950 has had long-term impacts to upland soils. Even though current trends are stable or improving, damage was done to the soils and vegetation of bunchgrass ridges, tall forb communities on benches and seasonally wet bowls near the tops of drainages. The primary impacts to soils early in the century were:

- Increased sheet, rill and gully erosion following loss of litter and plant cover especially in Packsaddle Basin and high on Mahogany, Henderson and Patterson Creek drainages.
- Compaction and displacement from trailing when soils were wet.
- Reduced site productivity from the loss of soil, change in plant species composition, reduced cover of desirable species and spread of noxious weeds.

Livestock grazing pressure in combination with the loss of beaver in riparian areas has had a number of impacts on wetland and riparian soils:

- A conversion of sedges to bluegrasses has reduced the ability of steam banks to withstand seasonally high flows (noted in Henderson Creek and Horseshoe Creek in 1993 inventories). This often results in increased bank sloughing and erosion.
- A reduction in the woody component of riparian vegetation has also reduced stream bank stability similar to the herbaceous example above. Some areas have shown a lowering of the water table (Henderson Creek, Patterson Creek and Packsaddle Creek), drying of soils and a vegetation type conversion to upland species.

- Heavy use of riparian areas has led to stream bank trampling, bank shearing and compaction of soils (Henderson Creek, Patterson Creek and Mahogany Creek).

The relatively small amount of **logging** since 1980 (787 acres) has had little impact on the analysis area compared to roads and trails and livestock grazing. Some areas within the timber sales, especially at landings, still show detrimental soil compaction, displacement and burning. The older logging associated with settling the Teton Valley has had little long-term impact to soils.

Succession and the Lack of Fire in Shrublands and Aspen

Soil cover is generally good in mountain brush communities with a possible reduction in site potential due to decadent stands and conversion to conifers on the patch borders.

Soil cover is generally good in sage/grass communities but the cover is more litter and duff and fewer live grasses and forbs compared to a more recently disturbed stand. Conifers are moving into these stands along the borders.

The shift to older age classes in mountain brush and sagebrush/grass communities has minor effects on soils. The increased canopy cover of older mountain big sagebrush stands does trap more snow than open, young stands and when melting occurs, more water infiltrates to greater depths in the soil (Knight 1994). The reduction in patch size caused by conifers establishing on the borders can reduce organic matter inputs and slowly reduce the productivity of these sites.

Litter and duff dominate the ground cover under older mountain mahogany stands rather than grasses and forbs. Deeper, more fertile soils on the patch borders are occupied by mountain mahogany due to the recent lack of fire. The expansion of patch sizes by mountain mahogany to deeper soils has minimal impacts to soils in the area.

Aspen succession to conifer has the greatest impact to soils due to the extent of this change since reference times. Reduced aspen canopy cover over time equates to a reduction in organic matter inputs from leaf fall. Studies in Utah and other western states have measured between 1600 and 2000 pounds per acre of leaf and twig fall from well stocked aspen stands (Jones 1985). The more closed canopy of conifers tends to reduce the herbaceous understory found under aspen (Bartos 1998) and further reduces the input of organic material to the soil surface. The needle fall of conifers slowly changes the reaction of the soil surface to slightly acidic. Over time the soil surface lightens and productivity of the site is reduced (Cryer 1992). This cycle can often be reversed with disturbance and the re-establishment of aspen.

HYDROLOGY REFERENCE CONDITIONS

The timeframe for reference condition is prior to 1840 when the beaver populations were abundant and streams were functioning in a near “natural” state. Little historical information was available so anecdotal accounts were relied on.

Stream Channel and Riparian Conditions

Historically the stream channels and associated riparian zones were more complex and diverse. Wood naturally accumulated in the riparian areas providing gradient control, sediment storage, pool formation, bank protection and hiding cover.

Willows were abundant and use by beaver and wildlife stimulated growth and vigor. Willow was important in providing shading to the streams and providing stable banks on the outside of meanders where pools and undercut banks could form to provide quality fish habitat. Other woody shrubs and sod forming vegetation was abundant and helped maintain dynamically stable stream channels and fish habitat. While streams may have been eroding in one area they were building in another. Localized sites of stream bank or channel instability were likely common (less than 20 percent) but rarely did they dominate the system. Discharge, sediment regime, vegetation types, valley morphology and geology and occasional disturbances determined channel morphology.

Streams were well connected to the floodplain as the channel forms were more closely tied to valley morphology than to channel and watershed disturbances. Beaver were abundant and had little competition from other herbivores for willows. Beaver complexes dominated many smaller streams. In areas such as Packsaddle where the valley bottom is wider and flatter, dams dissipated the energy of spring floods over a broad area and stored water maintaining higher summer flows in these creeks. These complexes also provided for the storage and removal of sediment, new areas for willows to colonize, over-wintering habitat for fish, and benefits to other riparian dependent wildlife species.

There were no manmade **impoundments** on the streams and the streams connected to the Teton River when there was high water. The only diversions were beaver dams. There were abundant beaver until 1840 when most of them had been trapped (Driggs 1970, Clements). Construction of irrigation canals and ditches began in 1889 (District Plan 1967).

Climate - There were major droughts in the mid 1930's, 1430's, and between 1240 and 1290. The wettest periods on record were 1617 to 1628 and 1906 to 1918. Severe drought years were 1475, 1632, 1695, 1824, 1902, 1934 and 1936. (Pearson 1978)

Sediment input was from natural events such as landslides or severe fires. Large, high severity fires in the watershed may have led to more unchecked runoff and extra sediment to the streams. Most of the trails were along the ridges and not in the stream bottoms as the vegetation was sparse along the ridges.

HYDROLOGY CURRENT CONDITIONS

The timeframe for current conditions is after 1840 when beaver populations were depleted.

Climate - The Big Hole Planning Unit, as classified by the Koppen System, is a cold snow-forest type, wet at all seasons with summers cool and short. The unit is in a belt of prevailing westerly winds that are controlled by the opposing Aleutian Low and Pacific High pressure

systems. The Aleutian Low predominates in winter, sending moisture laden southwesterly winds into the area. These air masses yield precipitation by the lifting and cooling processes of the northward trending mountain ranges. During the summer, the Pacific High increases in influence and lessens the intensity of this process and, there is an increased frequency of convective cell storms that can produce high intensity, short duration storms over the area. At times continental air masses developing in the interior can complicate these general patterns by introducing easterly winds that are generally dry.

Topography - The general topography of the Big Hole Mountains is very rough due to the steep slopes and narrow valleys. The mountains run in a northwest southeast direction giving very dry south - southwest aspect slopes and moist north - northeast aspect slopes. The aspect greatly affects the type and distribution of vegetation. Due to the steep slopes, most streams are either intermittent or have very low summer flows.

Temperature - The temperature regime consists of short cool summers and long cold winters. Extreme temperatures will range from 100 degrees F. during the summer to -60 degrees F. in the winter. Usually these maximum and minimum temperatures will occur during the months of July and January respectively. Daily variation is very high with as much as a 45 degree F. difference between day and night.

Precipitation - The greatest amount of precipitation for any single month usually comes as rain in May or June at the lower elevations and as snow in December, January or February at the upper elevations. At the lower elevations, snow makes up 40 to 60 percent of precipitation and at the higher elevations it can make up to 80 percent. Due to the orographic lifting effect of the Big Hole Mountains, precipitation increases with elevation. The precipitation ranges from 16 inches up to 52 inches. There are two snow courses: Pine Creek Pass at 6,750 feet and Garns Mountain at 8,300 feet. The snow course records indicate that snow accumulation begins in late November to December; reaches a maximum in March or early April and normally has melted off by mid June. From correlation with other nearby snow courses snow depth ranges are estimated to be from 110 inches at the higher elevations to 10 inches at the lower.

Evapotranspiration - Any attempt to estimate evapotranspiration in the mountains is complicated by the rapidly shifting elevations, aspects and vegetation. At best, we can only make generalized estimates from the temperature data and the type of vegetation. The greatest evapotranspiration on the unit is on the low elevation south-southwest aspect slopes. From these there is a gradient to the high elevation north-northeast aspect slopes. A general estimate for the analysis area would be 14 inches per year.

Wind - Predominate wind direction for this unit is from the southwest. Complicating this are locally generated winds. The slope and valley winds have normal daily cycles but it is very difficult to numerically quantify them.

Water Resources - The waters of the area are tributaries to the Teton River. The major tributaries flowing from this drainage complex are Packsaddle and Horseshoe Creek. The majority of flow comes from spring snowmelt and peaks in early June. Low flows are during

the winter months usually in January with occasional exceptions when a rain on snow flood event occurs.

Floods –There are three basic flood producing mechanism in this analysis area. The most common event is the annual spring snowmelt that produces the normal high flows. If a high snow pack is combined with a rapid increase in spring temperatures, the snowmelt could create flood conditions. The second type of flood is a rain on snow event. This usually produces the greatest peak and a more regionalized flood. They usually occur during the early to late spring when soils are frozen and all precipitation can contribute to runoff. The third type is the summer convective storm that develops a high intensity short duration storm that exceeds the infiltration rates for a microwatershed and produces a small, highly erosive flood. A fourth type of flood that is possible, but that has not been recorded in this area, is the formation and breakage of ice jams. Due to the limited access into this county during the winter, these ice jams have probably occurred but never been observed. The following table lists the floods of various recurrence intervals as determined by a method from Thomas et al. (1963) for two of the major streams that have a large drainage area on the unit. The runoff average is 12.5 inches per year.

	Drainage Area	Mean Annual Flood in cfs				
Stream	Miles^2	2.33 yr.	5yr.	10 yr.	20 yr.	50 yr.
Packsaddle Creek	10.9	76	91	108	120	133
Horseshoe Creek	10.1	71	85	101	112	124

Removal of vegetation by severe overgrazing beginning in the early 1900's has had the largest impact on the timing, duration, and magnitude of spring run-off and floods. The removal of ground cover decreased the infiltration rate and increased over land flow. This not only increased hillslope erosion it increased the magnitude of flows in the channels increasing the likelihood of channel and bank damage. There is evidence that during this era streams down-cut and destabilized.

Lakes - Packsaddle Lake formed by a landslide is 4.3 acres. No measurements have been taken on this lake but we can assume a few factors. From the high altitude and low temperatures we can assume the lake is normally high in dissolved oxygen and low in nutrients, however, due to its shallowness rapid increases in temperature are possible.

Ground Water - There have not been any comprehensive studies on ground water within the watershed. On the eastside of the Big Hole Mountains, the presence of springs would seem to indicate some ground water flow toward the Teton Basin.

Water Uses - Most declared uses within the watershed are for livestock watering with a few for present or projected recreation uses. Besides these easily quantified uses, the waters and stream courses are invaluable for fish and wildlife habitat, which must be protected. The waters of the unit also provide valuable recreation opportunities in the form of fishing and enhanced

campsites. Downstream uses are mainly restricted to agricultural diversions or private ponds. The city of Cedron at one time used Patterson Creek for culinary water.

Impoundments - Packsaddle Lake is the only current impoundment in the watershed. This landslide formed lake had a dam built on it early in the 1900's to provide extra storage for downstream irrigation. The dam leaked profusely, there was a lack of maintenance money and a decision was made to breach it, which was accomplished in the fall of 1975 returning it to its natural level. Breaching of the dam had little impact from a watershed standpoint but there probably was a loss to fisheries. Circa 1908 (Forbush 1992) there was an earthen filled dam constructed on the South Fork of Packsaddle Creek resulting in a 40-acre reservoir to store irrigation water. This dam failed circa 1915 and was not rebuilt.

There are currently small ponds in place on private land just below the forest boundary at Pole Canyon, Drake Creek and South Twin Creek. Of these ponds, only Pole Canyon involves a diversion on the forest. The Pole Canyon diversion has a history of illegal activities such as diversion of water outside of the legally permitted period from October 1 to May 1, unauthorized instream work with associated bank and riparian damage and illegal diversions.

Water Quality and Channel Function - There is a high density of stream channels on this unit and a majority of these streams are deeply cut into narrow steep valleys. All resource management activities have a high potential for delivering sediment to the stream unless care is taken. Examples of poor road construction and location are throughout the analysis area. Some streams are stable, while others are degrading or becoming entrenched. Streams can easily be unsettled by many activities with road building, grazing, and beaver removal having the greatest potential impact.

Table 3-2 lists water quality limited stream segments. Water quality limited means these bodies of water do not support their beneficial uses. Total maximum daily loads (TMDL) are watershed-based analyses of the quantities and sources of pollutants preventing water from meeting its beneficial uses. The aim is to restore those uses through reductions in pollutants added to the water. A watershed-based approach recognizes the effect of both point and nonpoint sources of pollution in degrading water quality. The TMDL analysis must identify the causes of beneficial use impairment and estimate pollutant loads which will meet water quality criteria and restore impaired uses within a specified time (State of Idaho 1999). Streams on the forest found to be contributing excess sediment could be sources targeted for reduction as part of meeting the TMDL.

Table 3-2. Water Quality Limited Stream Segments

Waterbody	Boundaries	Pollutant
Teton River	Headwaters to Trail Creek including, Pole Canyon, Little Pine, Drake Canyon, Grove, and Patterson Creek.	Habitat Alteration, nutrients, sediment
Packsaddle Creek	Headwaters to Teton River	Flow Alteration and sediment
Horseshoe Creek	Confluence of North and South Forks to Teton River	Flow Alteration

Changes in stream channel morphology, function, and resiliency have occurred. Morphology is defined as the shape of the stream measured by such parameters as width to depth ratio, sinuosity, gradient, and Rosgen channel type. Function refers to the streams ability to process watershed products including water, sediment, wood, nutrients and fish while maintaining a stable form. Since channels form to accommodate the watershed products they routinely process, the form of the channel should be stable unless a rare event occurs. If management increases the magnitude, duration or frequency of an event, function can be affected as the channel is altered and can no longer processes its watershed products. An example would be the channel entrenches due to an extreme event so it cannot dissipate energy and it erodes its banks and widens. The channel cannot process courser bedload and wood and continue widening. This channel is no longer functioning. To properly function, a stream needs to maintain its connnectivity upstream and downstream as well as laterally with its floodplain. A properly functioning stream is not aggrading or degrading at the watershed scale and is in a state of dynamic equilibrium. Resiliency is a term used to describe the ability of a stream to sustain impacts from a disturbance without major changes in morphology and function.

Heavy grazing removed much of the vegetation on the hillsides and also protective cover on stream banks. With plant cover removed from the hill slopes and infilitration rates reduced the frequency and severity of flooding increased. Due to heavy grazing on stream banks, the removal of wood from riparian bottoms, and access roads developed into the stream bottoms, the streams lost functionality and are susceptible to damage by the increased flows. Beaver were also extensively trapped, removing the gradient control features of the beaver complexes. Fewer beaver may decrease the ability of streams to dissipate its energy, affecting channel morphology and stability. There is evidence of down-cutting in many of the streams indicating a system that has lost resiliency. Streams that had once been adapted to valley morphology, geology, discharge and sediment regimes, are now changed as a result of adjusting to man caused disturbances resulting in dramatic changes in channel morphology, function and a loss of resiliency in some drainages.

Some streams have recovered while others are still entrenched and lack the desired late seral riparian plants to form stable resilient stream types. Part of the reason for the lack of recovery of riparian plants is due in part to the down-cutting and loss of connection of the streams to their flood plain. The magnitude of water that is now needed to create an overland flow has increased from what historically would have created over bank flow. This decrease in functionality of the stream and floodplain has led to a decline in riparian condition. Table 3-4 depicts existing conditions for Packsaddle and Horseshoe Creeks.

Table 3-4. Level II survey data

Aquatic Level II Data On Selected Streams									
Stream Reach *	Seral Status **	Bank Stability	Rosgen Type	Width/ Depth Ratio	Entrench-ment	Beaver Activity	%Pool area	LWD /mile	Temp C
NPKS -1	Late	95%	B	5	Mod	None	25%	1	11
NPKS -2	Late	89%	B	9 (6-15)	Mod	None	37%	10-20	12
PKS-1	Mid U to S	80%	B	8-35	Low	Inactive	15%	50+	11
SPKS-1	Late-Mid U to S	79%	B	6-15	Low	Inactive	27%	20+	10
SPKS-2	Late U to S	79%	A	9-14	N/A	Active	43%	20+	11
SPKS-3	Mid-Early S	87%	C	7-15	Low	Active	80%	N/A	8-12
SPKS-4	N/A	75%	B	6-34	Low	Inactive	28%	20+	11-12
SPKS-5	Late-Mid U to S	82%	B	10-22	Low	None	15%	50+	8
SPKS-7	Late U to S	90%	A	5	Low	None	16%	10	6-8
HS-1	Mid U and D	85%	C	10	Low	Abundant	20%	<20	8
SHS-1	Mid U to S	55%	B & C	6-27	Mod/Low	Inactive	19%	20	4-9
SHS-2	Late-Mid U to S	83%	B	5-9	Mod/High	Use no dams	19%	20+	7-8
SHS-3	Mid U to S	85%	A	3-11	Mod/High	None	14%	>20	6-8

* PKS = Packsaddle, HS = Horseshoe, N = North, S = South.
** U = Upward, S = Stable, D = Downward.
Temperature data is from spot recordings.

Following is a discussion of specific stream conditions and concerns associated with specific drainages. These are based on the watershed condition inventory for soil and watershed improvement completed in 1989 by Debra Patla. See Map 2 for stream locations.

Packsaddle Creek drainage is 7 square miles and contains the only significant lake. Packsaddle Lake is 4.3 acres, originally formed by a landslide (see impoundments under Hydrology). At one time there was a larger dam of about 40 acres located on lower Packsaddle Creek that failed circa 1915. This stream is likely only connected to the Teton River during runoff.

This stream is in good condition where beaver dams remain intact. Main Fork of Packsaddle Creek has no active beaver dams, but 8 possible, inactive, breached dams were noted. Heavy hedging of subalpine fir and dogwood by moose was found.

In North Fork Packsaddle Creek no beaver are present, and no evidence of past use (although an old beaver trap was found).

South Fork Packsaddle Creek.

There is a large section of the South Fork where it is evident that beaver once occurred but now are absent. Abundant willows exist to still support beaver populations. Packsaddle meadows had numerous active dams, 2 lodges and numerous old dams. Concerns about beaver in this drainage reached their peak in 1988 when most beaver were trapped. There were some discussions at that time with IDFG about closing the area to trapping but the IDFG was reluctant to regulate beaver trapping. Concerns in this drainage are ruts, rills, and gullies on system and non-system roads, sediment contribution from the Mikesell and Pintar mines, un-permitted use by cattle of the Packsaddle Lake area, mass wasting in the south fork area and exposed and poorly vegetated soil with raw gullies on the headwater slopes.

Dude Creek - is a small perennial stream on the forest located between Packsaddle and Horseshoe. It flows through a valley that is about 250 feet wide. Old beaver ponds demonstrate that this area once held abundant willow and riparian vegetation. The current low density of willows in an area that once supported beaver would indicate that either beaver were removed due to competition from cattle and sheep for willows or the beaver were trapped. Present information indicates that the current amount of willow growth may not support beaver.

Horseshoe Creek - drains 10.1 square miles. It consists of a North and South Fork with named tributaries of Superior, Bell, Hillman, Brown Bear, Irene and Porcupine Creeks. These tributaries originate on private lands except for Superior Creek, which originates on Forest land. Digging the Samuels coal tunnel resulted in the placement of 300 cubic yards of overburden in North Horseshoe. On North Horseshoe it has been noted that old mining tailings, roads and channel disturbances continues to cause instability and sediment input.

Some reaches of the stream show signs of entrenchment. Beaver were more prevalent in this system at one time. Main Horseshoe Creek once had 40 +/- inactive dams and 15+ active dams with three caches. Areas where streams are entrenched are related to the lack of current beaver

activity. There are references of past intensive trapping in the area. In 1965 there was a beaver management plan written and in 1988 an attempt was made to close the area to beaver harvest. Improved management of beaver populations would lead to improved riparian and fish habitat conditions. Observations in the fall of 1999 indicate better beaver management is needed if this area is to meet its full potential. South Fork Horseshoe Creek has many inactive, breached beaver dams, but no active use.

Concerns in this drainage are severe erosion on the Idaho Mine road, associated exposed soil with the Idaho Mine, mining disturbances in Superior Creek, and heavy sheep impacts on Mt. Manning ridge and degraded riparian conditions in Superior Creek.

Mahogany Creek – drains approximately 9 square miles. Main Mahogany creek is about 1.5 miles long with a North and South Fork approximately 2 miles each in length. North Mahogany was characterized in 1989 as entrenched, depositional with an unstable channel bottom and mass wasting occurring along the upper banks. The lower sections of the fork with current beaver activity are more stable. In 1989 there were eight active beaver dams. Brook trout were documented in the North Fork in 1998 but no quantitative surveys have been conducted. Mahogany is diverted for irrigation use may only be connected to the river during runoff. Kerry Buxton (2000) reports that there is a migration barrier (small diversion dam) on Mahogany Creek on private land behind Jaydell Buxton's home.

The South Fork of Mahogany in 1989 was in better condition than the North Fork but still had steep banks and mass wasting occurring. There was one inactive beaver dam in this Fork and down cutting. no beaver use in the upper reach of the South Fork; there was no evidence of beaver use in the mid reach; there was one inactive beaver dam with water spread out over a broad area in the lower reach. In 1989 there were 8 active beaver dams in the lower portion of the North Fork. .

The aquatic habitat conditions in general are reported as "excellent" (Patla 1989). However, she reports mass wasting of high banks, trail routes accelerating erosion, high suspended sediment loads during runoff, stream capture by the road at high flows and diversion structures that need improvement. Other references are made about problems with historic grazing and the continued instability of un-recovered portions of the watershed creek. In the winter of 1987-1988, a government trapper is reported to have attempted to eradicate beaver from the drainage in an effort to avoid problems at the diversion. Severe stream erosion has been reported one mile upstream from the Forest boundary. Currently there is no permitted grazing in this drainage.

Concerns in this drainage are the trail accelerating bank erosion along Main Mahogany, water on the roads and trailhead during runoff and historic and current sheep use in areas sensitive to gullying and erosion.

Henderson and Patterson Drainage – Henderson Creek originates from two springs. Henderson Creek as of 1998 had a high degree of cattle damage. Surveys of this area in 1988 listed Henderson and Patterson as the most impacted area in the East Big holes with grazing impacts similar to those seen in 1998 and 1999. This area has a history of overgrazing. There

is evidence of attempts to use electric fencing along the creek to improve conditions. This area is part of the Westside allotment and is currently grazed under a deferred method. The lower part of this drainage is entrenched showing evidence of past disturbance. Areas of the stream are lacking in woody vegetation. Near the forest boundary is an ATV crossing that has degraded the stream. One half mile from the Forest Boundary on road 543 is a stream crossing where the road is capturing the stream during high flows. This stream is not connected to the main river. No beaver are present, and there was no evidence of past use by beaver.

The adjacent Dry Canyon to the north contains no perennial flow and has similar issues as Patterson Creek related to the co-location of the road and drainage bottom.

Cattle damage in Patterson Creek is similar as reported on Henderson Creek. The location of the current road in Patterson Creek does not meet the management prescriptions for aquatic influence zones (prescription 2.8.3). This road is located in the floodplain and at times in the existing channel contributing to the sediment load, inhibiting plant development, and impacting stream bank structure.

Concerns in these drainages are headwater areas of gullies, poor ground cover, increased downstream vulnerability, weedy species indicative of overgrazing and loss of bank structure.

Grove Drainage – This is part of the same allotment as Patterson and Henderson and has similar issues related to grazing.

This drainage also has similar road issues as Patterson with the road and stream essentially being co-located.

Concerns in this drainage are no buffer between road and stream, stream capture by the road and impacts from grazing that are not as severe as Henderson and Patterson.

FISH REFERENCE CONDITIONS

The time frame for reference condition is prior to 1880 when streams followed their natural course.

Historically only one species of trout occurred in Mahogany Creek Watershed and the mainstem of the Teton River, the Yellowstone cutthroat (*Oncorhynchus clarki bouvieri*). Other native fish that were likely present were mottled sculpin, Piute sculpin, mountain whitefish, speckled dace, longnose dace, mountain sucker, bluehead sucker, and redside shiner.

Streams and rivers were connected and free flowing. This connectivity allowed the transfer of genetic material between and amongst populations. Connectivity also allowed for recolonization of areas where local populations had been extirpated due to disturbances such as floods, fires, droughts, and landslides. There were two life history patterns for Yellowstone cutthroat in the analysis area, fluvial or resident. Fluvial cutthroat from the Teton River used

tributaries in the analysis area for spawning and early rearing habitat while juveniles and adults migrated to the Teton River. The streams that were most likely used by fluvial fish for spawning were Horseshoe, Mahogany, Twin Creeks and Little Pine. Fluvial fish can also use intermittent streams for spawning if the flows persist long enough. There may also have been movement of adult and sub adult fish into the Henry's Fork and Snake River from the Teton River. Resident cutthroat trout may spend their entire life within the same reach of small stream.

FISH CURRENT CONDITIONS

The timeframe for current conditions is after 1880 when the first European Settlers came to the Valley and began to divert water and create barriers.

It appears that all trout populations are now resident populations with no fluvial interaction. Most of the streams with cutthroat have been stocked at one time with this species. Most of these cutthroats came from Henry's Lake and were stock from the Ashton Hatchery. These fish were likely introgressed with rainbow genes. These fish will be treated as pure since the draft Intercross Policy of the USFWS states that populations hybridized up to 50 percent will be treated as if they were pure.

The fine spotted Snake River cutthroat (O*ncorhynchus clarki* subsp) is closely related to the Yellowstone cutthroat and has been introduced to the Teton River drainage (Behnke 1992, Kellogg 1998). No fine spotted cutthroat were found within the analysis area.

Whirling Disease is a disease that has been imported to the United States from Europe and has been confirmed in the Teton River but not within the analysis area. Its primary mode of spread has been through the stocking of infected fish. It infects all salmonids with the greatest impacts on cutthroat and brook trout. It is fatal primarily in young fish reducing recruitment into the population (Thompson 1999).

Following is a discussion of presence of fish species in the watershed. See the hydrology section for a discussion related to stream condition and fish habitat.

Packsaddle Creek Collotzi (1976) reports that Packsaddle contains only brook trout and makes no mention of stocking. Idaho Fish and Game historical stocking records show stocking of Packsaddle Lake in 1978, 1993, and 1996 with Henry's Fork Lake cutthroat. In 1981 Packsaddle Creek was stocked with 5,000 cutthroat/hybrid fry (IDFG 1967-1996). Stream surveys performed by Kellogg (1998) report a population of 25 percent cutthroat and 75 percent brook trout in the North Fork and 15 percent cutthroat and 85 percent brook trout in the South Fork of Packsaddle Creek with no visible hybrids. The higher percentage of cutthroat in the North Fork may be attributable to the stocking of cutthroat in Packsaddle Lake

Dude Creek There are no reports of fish ever occupying this drainage.

Horseshoe Creek Collotzi (1976) reported 15 percent brook trout, 85 percent cutthroat and some sculpins. This drainage was also stocked with cutthroat fry from the Ashton and Nampa hatcheries. The egg source for these fry was Henry's Lake (IDFG). The stream was stocked with 30 to 40,000 fry in 1968, 1969, 1970, 1973, 1975 and 1978. Fish surveys completed in 1998 (Kellogg) on the South Fork near the confluence with Bell Creek and above the confluence with Superior Creek indicated both reaches were about 50 percent cutthroat and 50 percent brook trout. There is no existing data on the fish within the tributaries or the North Fork.

Horseshoe Creek has the highest level of connectivity to the Teton River. Jim Douglas, a permittee and landowner, states that in some years there is flow that makes it to the Teton River year round. Most years it is only connected during runoff. Judging from the size of cutthroat there is no evidence of fluvial interaction of cutthroat in this stream with the Teton River.

North Twin Creek is the only Twin Creek to contain fish. The 1998 surveys indicated 36 percent cutthroat and 64 percent brook trout. It was characterized as an overgrown stream with good habitat. Middle Twin merges with North Twin off forest. These two streams may have some connection to the main river during high runoff years. There were no fish captured on Middle Twin. South Twin also did not contain any fish. South Twin has no connection to the main river. It empties into a small fishpond on private land that is stocked with rainbow trout.

Mahogany Creek Collotzi (1976) reported an abundant population of brook trout above the forest boundary with no reports of cutthroat. Kellogg (1998) sampled 31 fish with 39 percent being cutthroat. Higher in the drainage the population of cutthroat dwindled to 18 percent of the total population. A possible explanation of the appearance of cutthroat trout may be the 1978 stocking of 3600 1.9 inch cutthroat (9 lbs) in Mahogany Creek (Idaho Fish And Game Stocking records 1967-1996). There is no data on fish in the South Fork of Mahogany.

Henderson Creek was surveyed for fish in 1998 with no fish being captured.

Patterson Creek was surveyed for fish in 1998 and found to contain only brook trout.

Grove Creek was surveyed in 1998 and is a non-fish bearing stream.

Drake Creek has a small population of brook trout on the forest. The stream is dammed just below the Forest Service boundary to form a small pond that is stocked with catchable rainbow trout. This area has impacts related to past sheep use and current trespass by sheep and cattle from Westside Cattle Allotment.

Kellogg (1998) reported a cutthroat brook trout ratio of 2:1 in **Little Pine Creek**. Wood canyon a tributary to Little Pine Creek contained 15 cutthroat to 17 brook trout in the area sampled in 1998. The vegetation was characterized as thick and impenetrable in spots. There were impacts from roads and four-wheeler use associated with the power line. Murphy Creek also a tributary to Little Pine, contained 15 cutthroats versus 12 brook trout in 1998, sculpin were also caught. A moderate amount of grazing damage to the stream was noted in one 40-yard section.

Pole Canyon was checked for fish in 1998 with negative results.

Table 3-5. Summary of stream and fish conditions

Stream	Connection To Teton River	Fish Species % brkt/cut	Road/Trail Impacts	Grazing Impacts	Beaver	Beaver Needed/ Habitat	Excessive Bank Erosion
Packsaddle North Fork	Runoff	75/25	L	L	P	No	No
Packsaddle South Fork	Runoff	85/15	M	L	P	Yes/P	No
Dude Creek	None	None	None	M	A	Yes/A	No
Horseshoe South Fork	Runoff to year round	50/50	L	L	P	Yes/P	No
Horseshoe North Fork	Runoff to year round	No data	M	L	P	Yes/P	No
North Twin	Runoff	64/36	None	L	A	NA/P	No
Middle Twin	Runoff	None	None	L	A	NA	No
South Twin	None	None	None	L	A	NA	No
Mahogany Main	None	61/39 82/18	H	None	P	Yes/P	Yes
Mahogany North Fork	None	No data	M	None	A	NA/P	Yes
Mahogany South Fork	None	No data	None	None	A	NA/P	Yes
Henderson	None	None	H	H	A	NO/A	No
Patterson	Runoff	100/0	H	H	A	NA/P	NA
Grove	None	None	H	H	A	NA	NA
Drake	None	100/0	H	H	A	NA	NA
Little Pine	Runoff Year round	33/67	L	L	P	NA/P	NA
Wood canyon	Via Little Pine	54/46	M	M	A	NO/A	NA
Murphy	Via Little Pine	45/55	L	L	A	NO/A	NA
Pole Canyon	None	None	H	L	A	NO/A	NA

H = High, M = Moderate, L = Low, NA = Not available, P =Present, A= Absent

REFERENCE CONDITION OF FORESTED VEGETATION

The timeframe selected for reference condition for vegetation is prior to 1880 when humans had little influence on the landscape. Native Americans and fur trappers had influence on the natural resources in this area prior to 1880, but not in concentrated amounts. Native Americans burned the land to reduce hazards and improve the habitat and hunting grounds for game species (Ogle 1997). This usually occurred from the valleys to mid slope.

Main Forested Vegetation Types

Since about 12,000 years ago, the climate and vegetation types havce been similar to the present. They are subalpine fir forests consisting of lodgepole pine, Douglas fir, subalpine fir, aspen Englemann spruce and associated understory species. (Pearson 1978) Following is a general description of the timber on the Palisades National Forest in 1914 (USDA Forest Service 1914). "The timber value of the Palisade National Forest is such as to give it possibly fair standing among similar Forests, but unfortunately the best belts are hopelessly inaccessible and therefore of small value. Once there was a far better percentage of Douglas fir, which is the best species we have, but lodgepole pine readily replaces this species after fire and the Douglas fir appears to be doomed. Nearly all the old fire areas show this result. The natural reproduction favors the lodgepole pine very generally. Englemann spruce and alpine fir hold second place, each one being well represented. Douglas fir requires protection and assistance in reproduction. Aspen grow throughout in the openings and is an intermediate species between the conifers and brushlands. The timber along the border near settlements is valuable for building purposes, but the average timber value of this Forest is very low on account of it being mostly beyond reach."

Processes Associated With Forested Vegetation

All of the natural processes are interrelated. It is difficult to discuss one without considering all of them. The processes formed and maintained the forested vegetation until humans manipulated them. A discussion of the natural processes responsible for establishing and maintaining the forested vegetation follows.

<u>Succession</u>
Succession is a gradual evolution of plant communities from bare ground to climax after a major disturbance such as fire. The following discussion of succession is derived from *Fire Ecology of the Forest Habitat Types of Eastern Idaho and Western Wyoming* by Anne F. Bradley and others (1992). Various types of disturbances (light, moderate, severe) will change or set succession back to early seral stages at any time.

After a severe disturbance, most forested communities are in the grass/forb/shrub stage until the tree species become established. Which tree species regenerates depends on the seed available within the stand.

Lodgepole pine grows in a variety of climatic conditions. The seedlings are relatively resistant to frost injury and often survive in frost-pockets where other species do not. Lodgepole is very shade intolerant and grows best in full sunlight. It is a dominant seral species with a vigorous understory of shade tolerant (Douglas fir or subalpine fir) species that will replace lodgepole in

100-200 years. Fire has played an important role in the successional continuum of this species. Serotinous cones enable lodgepole to regenerate after a fire and fire may select for the closed cone habit. Nonserotinous cones allow the lodgepole to restock when minor disturbance occurs in the stand and maintains the species presence in mixed conifer stands. It grows in pure stands and in association with Douglas fir and subalpine fir. (USDA Forest Service 1990)

Where lodgepole pine serotinous seed is available a dense seedling stand readily becomes established. Nonserotinous seed sources develop a more open stand over a longer period of time. Subalpine fir is not usually present at this time. Without disturbance, a dense pole stand becomes a crowded mature stand. Competition somewhat reduces stand density. The understory vegetation is sparse in this situation. Light to moderate disturbance can open a mature stand and permit development of mixed understory species. The mature lodgepole pine stand eventually breaks up due to bark beetle, disease or decadence. Subalpine fir is able to establish under a mature canopy and slowly out-competes lodgepole pine. Stands with dying lodgepole and fir understory are susceptible to severe fire because of the high fuel loads. Severe disturbance starts the succession process over. Without disturbance, the stand is eventually dominated by climax spruce and subalpine fir.

Douglas fir grows in pure even and uneven aged stands or in association with other species such as lodgepole pine, subalpine fir, Englemann spruce and aspen. The proportion of Douglas fir to other tree species depends on aspect, elevation, soil type, past fire and logging history. Seeds germinate best on moist mineral soil and the first-year seedlings survive best under light shade, but older seedlings require full sunlight. Douglas fir is moderately tolerant of shade. The natural occurrence of Douglas fir in pure stands is usually a result of fire. The species rapid growth, longevity and thick bark allow it to persist across the landscape. Without fire or other disturbance, Douglas fir would gradually be replaced by subalpine fir.

Douglas fir dominated stands begin in the same manner as lodgepole pine A moderate disturbance in mature Douglas fir will result in an open overstory with Douglas fir establishing in the understory. If no fire occurs, subalpine fir and spruce establishes beneath the mature stand and after several centuries, an undisturbed stand succeeds to pure subalpine fir.

Subalpine fir grows in the coolest, wettest forested areas in the West and its range extends to timberline. It does not tolerate warm temperatures and is the most shade tolerant species found in the watershed. Subalpine fir is the climax successional species in the watershed. It is found in association with Englemann spruce, Douglas fir and lodgepole pine. Subalpine fir seed germinates best on mineral soil and moist humus and is less exacting in its seedbed requirements than its associated species.

Succession in a **mixed conifer** stand starts with the seedling stage where Douglas fir, lodgepole pine and subalpine fir are present. Douglas fir and lodgepole pine dominate the pole and mature stages. If disturbance does not occur in a mature stand, subalpine fir dominates the overstory with scattered long-lived Douglas fir; the understory is dominated by subalpine fir. Eventually without disturbance, a climax stand forms dominated by subalpine fir. Severe disturbance in any of the stages returns it to the grass/forb/brush stage. A low to moderate disturbance in the pole stage will thin the stand or favor Douglas fir and results in an open

Douglas fir stand with a few lodgepole pine. Moderate disturbances in mature stands remove most of the species and leave the site dominated by open Douglas fir.

Englemann spruce grows in a humid climate with long, cold winters and short, cool summers. It usually grows with subalpine fir along streams or on north facing slopes. Seeds germinate on duff layers or moist mineral soil and germination is best under partial shade. Englemann spruce is shade tolerant but less so than subalpine fir. Englemann spruce may be a long lived seral species or a climax or co-climax with subalpine fir. It is usually found along creeks and on moist north facing slopes.

Trembling aspen is the most widely distributed tree in North America. It grows very quickly usually in even-aged stands and is the most shade intolerant trees species in the watershed. The aspen in the watershed is seral. Climax stands may be present, but this needs to be confirmed with surveys.

Regeneration is by seeds or suckering. Seedling establishment is rare due to short-lived seed, insufficient soil moisture at the time of seed dispersal and demanding seedbed requirements. Seed is viable only for two to four weeks. Seed dispersal occurs in June or early July when there is little precipitation and seedbeds are dry. High and continuous availability of water is critical for the survival of the small delicate, succulent seedlings. They are very intolerant of moisture stress and high temperatures at the soil surface. (Schier)

Suckering is the most common method of reproduction. Cytokinin produced in roots stimulates suckering while auxin translocated from crowns inhibits suckering. Disturbances that increase the cytokinin:auxin ratio results in sucker production. Methods that remove most of the mature trees such as stand replacing fires or clearcutting are the best ways of obtaining aspen regeneration because it reduces apical dominance to a minimum and enables shoots of this shade intolerant species to grow in full sunlight. (Schier)

Aspen requires a least a moderate intensity fire to kill most or all of the overstory to stimulate adequate suckering. Although aspen forests do not burn very well, the tree is very sensitive to fire due to its thin bark. (Debyle 1985)

Where aspen roots are present, severe disturbance causes aspen to resprout after a brief grass/forb stage. Conifer seedlings may develop under an aspen overstory at any stage. Moderate to severe disturbance returns the stand to the grass/forb stage that is quickly repopulated by aspen suckers. Without disturbance, the conifer understory eventually replaces aspen which cannot regenerate successfully under the shade. Severe disturbance in the conifer stage will result in aspen regeneration if the root system is not too weak. Conifers may become dominant on many of these sites in 200 to 400 years without a major disturbance.

The forested stands developed under the above scenarios with fire as the major disturbance. Other disturbances such as windthrow, avalanches, insects and disease infestation set succesion back to an eary seral stag. Given the ages of the current stands, this area was severly disturbed and forested stands were established between 1803 and 1913. Prior to 1880, most of the watershed was in a seedling, sapling, pole stage with fewer stands in the mature stage.

"Practically the whole Forest is covered with small growth and reproductions of either Douglas fir or lodgepole pine" (Targhee Fire Plan 1911-1929). Following is a discussion of various disturbances that occurred during reference time.

Fire

Following are descriptions of the three fire groups found in the analysis area. The descritions are adapted from Bradley et al. (1992) supplemented with information from reports on file at the Caribou and Targhee National Forests.

1. Most of the forested vegetation falls within Fire Group Six: Mid and Lower Elevation Subalpine Forests. Fire led to dominance by one or more seral species, created openings in dense stands, provided mineral seedbed for seedling establishment and created a mosaic of different ages and species in subalpine fir habitat types. Where aspen is seral, succession to conifers made stands increasingly susceptible to fire as succulent forbs are succeeded by woody fuel and litter. Generally moist conditions and slower rates of fuel accumulations make large fires in subalpine forests unlikely except during periods of drought and high wind. According to a dendrochronological study in south central Idaho, the severe drought years were 1475, 1632, 1695, 1824 and 1902 (Pearson 1978) which may have led to stand replacing fires in the watershed. Most fires that consume significant acreage in subalpine fir and spruce habitats are high intensity crown fires during dry, windy conditions that accompany cold fronts (Crane 1982; Fryer 1988). Lightning starts fewer fires in subalpine habitat types than it does in drier, warmer forest types.

In the northern Rocky Mountains, Arno (1980) estimated fire intervals of 50 to 130 years for subalpine habitat types. Lodgepole pine dominated subalpine fir forests in the Little Firehole River drainage of Yellowstone National Park experienced large stand replacement fires probably once in 300 to 350 years (Romme 1982). Barrett (1994) characterized these forests as having a mixed severity fire regime with a moderately long fire return interval. He reported the mean fire return interval ranging from 25 to 113 years for sites in southeastern Idaho. In general, sites with aspen or Douglas fir are represented by the short end of reported fire return intervals for subalpine forests (Barrett), while sites with lodgepole pine typically report longer fire return intervals (Romme). These fire intervals were not entirely devoid of human influence.

2. A portion of the forested vegetation may be within Fire Group Three: Mesic Dougals fir Habitats. Additional vegetation surveys would determine this. Fire regimes of Douglas fir and lodgepole pine are variable (Kilgor 1981). Topography, weather, stand structure, fuel loading and arrangement all contribute to different patterns of fire intensity and frequency. A complete range of fire behavior is represented in this type from light surface fires to stand replacement fires. A mosaic of fire effects probably occurred across the landscape, with much variability existing within a single fire (Arno 1980). Stands are thinned or replaced and the potential dominance of one species over another is altered. Thinning fires favor Douglas fir because mature trees are relatively fire resistant. Stand replacement fires favor seral lodgepole pine or aspen on sites where seeds or suckering roots are available. The success of aspen regeneration depends partly on the severity of the fire. A high severity burn may retard or reduce aspen suckering if shallow roots are exposed to lethal heating. Large coverages of aspen, lodgepole pine, ceanothus or pinegrass may indicate a recent history of severe or repeated burning (Steele

1983). On some habitat types, shrubs have the potential to dominate stands if fire removes the Douglas fir overstory.

Arno (1980) reported a mean fire free interval of 15 to 30 years for the Douglas fir habitat types in the northern Rocky Mountains. Houston (1973) estimated pre-settlement fire frequency of 20 to 25 years for conifer sagebrush steppe vegetation in northern Yellowstone Park. In the Jackson area of Wyoming, Loope and Gruell (1973) estimated a fire frequency between 50 to 100 years for lower elevation conifer forests. Loope and Gruell (1973) estimated a fire frequency of 25 to 100 years for a Douglas fir forest with seral aspen on Blacktail Butte in Grand Teton National Park. In southwestern Montana, stands of Douglas fir on the ecotone between forest and sagebrush/grassland had pre-settlement fire free intervals of 35 to 40 years (Arno 1983). Barrett (1994) reported a mean fire return interval of 54 years in Douglas fir stands on the Caribou National Forest.

3. Fire Group four is composed of community types where quaking aspen is a seral species. Aspen is a seral species in habitat types in several fire groups and the role of fire described for this fire group applies where aspen is seral.

Aspen stands may be even aged or uneven aged. Uneven aged stands are more characteristic of situations where aspen is the climax species. In uneven aged stands, regeneration takes place as a gradual process with new suckers establishing as older stems die from age or disease. Uneven aged structure also occurs where aspen clones are invading surrounding grassland or shrubland. The role of fire in uneven aged stands is not clear. Where aspen forms even aged stands (the bulk of the watershed), it is generally seral to one or more conifer species and results from rapid suckering after disturbance. Fire plays a significant role in maintaining and regenerating aspen on these sites.

Aspen mature between 60 and 80 years of age and deteriorates rapidly after 120 years. Fires in aspen and aspen conifer stands before and during the mid 19th century were apparently larger and more frequent than today (DeByle 1987).

A fire history study of two aspen conifer sites in the Fontenelle Creek drainage of Wyoming estimated the mean fire free interval to be 40 and 41 years (Arno 1981). Barrett (1994) reported a mean fire return interval of 45 years in aspen conifer sites on the Caribou National Forest.

Insects and Disease

Insects and diseases have been a major (epidemic) and minor (endemic) disturbance in the watershed. **Bark beetle** infestations in lodgepole pine and Douglas fir were at endemic levels given the young vigorous age classes of the forested vegetation. Prior to establishment of the current stands, it is assumed that bark beetles were at epidemic levels in mature lodgepole pine creating many dead trees that eventually fell over and provided high amounts of fuels to allow stand replacing fires to burn through the stands starting the successional processes and creating todays stands. **Western spruce budworm** was probably present in the old dense stands although no records exist of any outbreaks and epidemics follow no typical pattern. **Dwarf**

mistletoe may have been at lower levels due to re-occurring low intensity fires. **Subalpine fir complex** was less prevalent as the species was not as widely distributed across the landscape as today.

Other Disturbances

Other disturbances have a similar effect on succession of forested vegetation as fire, insects and disease.. The other disturbances common within the Mahogany Creek Watershed are windthrow (blowdown) and avalanches. These usually are localized events and disturb small areas. Avalanches are common on the steeper, higher elevation slopes especially below the ridgetop (Relay Ridge) forming the western boundary of the watershed. Windthrow disturbs small to large groups of trees setting succession back to an early seral stage (usually bare ground). This disturbance is isolated and usually occurs on ridges or exposed slopes.

Patch Size

Forested vegetation patch size and distribution were very similar to today's landscape given the variety and steepness of slopes and less frequent fires in the subalpine forests. There were extensive acres of lodgepole pine in the north end of the watershed where flat rolling topography aided the spread of large stand replacing fires. There were large patches of aspen along the forest boundary that had been maintained by frequent fires. Timbered patches wer not biscected by roads and trails.

The following is a snapshot in time representing historic distribution of forest vegetation before human manipulation. This information was derived from comparing 1951 and 1943 aerial photos to 1995 aerial photos. The 1951 and 1943 photos are the earliest available. Realizing this is may have looked like in the past. Most of the data is qualitative rather than total acres of historic vegetation types. This information is divided into geographic locations in the watershed. There are also descriptions of timber conditions from the 1914 Land Classification for Palisade National Forest.

The Area North of South Packsaddle Creek to Grandview Point

The 1951 photos indicate more aspen than Douglas fir below an elevation of 7600 feet. Above 7600 feet, contiguous stands of conifers are predominant. The conifer stands were either pure stands of lodgepole pine or Douglas fir or mixed stands of the two species with very little subalpine fir present in the overstory. These stands originated between 1820 and 1920 indicating a diversity of species and seral stages as it took 100 years to establish the stands. The conifer patch sizes were similar to today. Most of the younger stands appear to be below 7600 feet probably as a result of more recent fires that may have originated from the Valley floor. Patches of aspen were larger in 1951 than now as some have been cut or plowed and some stands have been slowly invaded by conifers following the succession process. The aspen was younger and more vigorous during the time of reference conditions.

"The timber land is dense lodgepole pine with a small percentage of Douglas fir and a little aspen. Lodgepole pine is in the smaller sizes and the older timber is Englemann spruce and

Douglas fir with a small percentage of alpine fir. Some aspen groves occur occasionally covering more open areas and serving as a nurse cover for better species. The reproduction is in favor of lodgepole pine and against Douglas fir. Between Horseshoe and Milk Creeks, much of the timber is young (20 to 30 years old) lodgepole pine. About 10 percent of the lodgepole pine has been cut to provide houselogs and poles." (USDA Forest Service 1914)

The Area North of Mahogany Creek to Horseshoe Creek

These forested stands originated in 1863 to 1903. The 1943 photos indicate the forested vegetation on the south facing slopes was composed mostly of aspen. The area at the Forest boundary on Horseshoe Creek had not been manipulated for farming and houses; 1943 photos indicate that there was ¾ more aspen than now. The conifer stands were younger, more vigorous and earlier seral stages.

"The timber belt on Twin Creek is an excellent stand of Douglas fir, Englemann spruce and alpine fir with a certain percentage of smaller lodgepole pine. All natural reproduction favors lodgepole pine and is usually good. The woodlands consist of lodgepole pine shading into aspen. Approximately five percent has been cut to met the needs of the settlers." (USDA Forest Service 1914)

The Area North of Highway 31 to Mahogany Creek

These forested stands originated between 1803 and 1941. The aspen stands were more extensive in patch size and were younger and more vigorous. The conifer stands were younger, more vigorous and earlier seral stages. There may have been a large fire in Grove Creek around 1910 or earlier as a lot of the trees near the Forest boundary were 10 to 15 feet tall when Verl Bagley (75 to 80 years old) picked huckleberries as a kid (pers.comm. V. Bagley 2000).

"The timber belt on Mahogany Creek is an excellent stand of Douglas fir, Englemann spruce and alpine fir with a certain percentage of smaller lodgepole pine. All natural reproduction favors lodgepole pine and is usually good. The woodlands in Henderson and Patterson consist of lodgepole pine shading into aspen. The timber in Little Pine and Drake Creek is mainly lodgepole pine with a small percent of Douglas and alpine fir. A great part of this area is an old burn dating back 25 to 50 years ago and the presence of so much lodgepole pine is due to this old burn as burns seemingly restock more readily to lodgepole pine than any other species. Brushlands consist of aspen and shrubs of all kinds and form the outskirts of the timbered areas. Little cutting has been done in this area." (USDA Forest Service 1914)

The Area South of Victor, Idaho in the Snake River Range

These forested stands originated between 1820 and 1938. The aspen stands were more extensive in size and were younger and more vigorous. The conifer stands were younger, more vigorous and earlier seral stages. The younger aspen and lodgepole pine stands had greater densities than today's stands.

"The timber is composed mostly of Douglas fir and lodgepole pine with Douglas fir principally in dense stands in narrow canyons and steep sidehills. Along the Forest boundary, some logging has occurred for houselogs, sawtimber and poles. The natural reproduction is good and even the Douglas fir seems more or less permanent though lodgepole pine seems to come in after cutting." (USDA Forest Service 1914)

CURRENT CONDITION OF FORESTED VEGETATION

The timeframe for current conditions is after 1880. The first concentrated permanent settlements began at this time and relied on natural resources for their livelihood. The first European settlers came to Teton Valley and began to harvest timber, graze livestock and suppress fires.

Main Forested Vegetation Types

Mahogany Creek Watershed is composed of mostly mature forested vegetation. The tree species are lodgepole pine (*Pinus contorta*), Douglas fir (*Pseudotsuga menziesii*), subalpine fir (*Abies lasiocarpa*), Englemann spruce (*Picea englemannii*) and quaking aspen (*Populus tremuloides*). The primary understory species are blue huckleberry (Vaccinium globulare), mountain maple (*Acer glabrum*), common snowberry (*Symphoriocarpos albus*), meadow rue (*Osmorhiza chilensis*) and pinegrass (*Calamagrostis rubescens*).

The forested vegetation types comprise 32,215 acres (75 percent of the total acres) within the watershed. Generally, conifers are found above 7600 feet; below this is the transition zone where a mixture of conifer, aspen and nonforested vegetation is found. The Table 3-6 indicates the composition of the forested vegetation within Mahogany Creek Watershed.

Table 3-6. Current Vegetation

Vegetation Type #	Total Acres	Percent of Forested Acres	Percent of Watershed Acres	Location
Mixed Conifer (1) Mature	12,707	40%	30%	South of Packsaddle Cr. All elevations
Lodgepole Mature	6,149	19%	14%	Scattered throughout
Mixed 3 Conifer (2) Mature	5,748	18%	13%	East side of Big Holes, All elevations
Aspen Mature	4,914	15%	11%	Scattered, Lower elevations
Douglas Fir Mature	1,183	3.7%	3.5%	Small scattered patches
Lodgepole Seedling (3)	839	2.5%	1.8%	Higher elevations north Packsaddle Cr.
Lodgepole Poles (4)	473	1.5%	1.1%	Upper elevation north Packsaddle Cr.
Englemann Spruce Mature	157	0.5%	0.4%	Scattered south of Dry Henderson
Aspen Seedling/sapling	45	0.1%	0.1%	Between Dry Henderson &Henderson, Mahogany Creek

(1) Mixed Conifer – Stands of Douglas fir and lodgepole pine.
(2) Mixed 3 Conifer – Stands of Douglas fir or lodgepole pine with subalpine fir component.
(3) Seedling – 6 inches tall to 1 inch DBH.
(4) Poles – 1 inch to 7 inches DBH.

Mixed Conifer

Most of this vegetation type has not been surveyed and the data is based on landsat imagery and data from a few stand exams. These stands are located throughout the watershed, predominately south of Packsaddle Creek. These stands are intermixed with other vegetation types in a random pattern on the east side of the Big Hole Mountains. They compose the entire area of the Snake River Range. The composition of this type is a mix of Douglas fir and lodgepole pine with small components of aspen or subalpine fir depending on stand location. Most of the stands have subalpine fir seedlings in the understory along with mountain maple, choke cherry, common snowberry, service berry, mountain ash, blue huckleberry, pine grass and elk sedge. The basic characteristics of the stands are average diameters ranging from 5.0 to 11.0 inches, ages ranging from 97 to 138 years, stand densities are varied and range from 236 to 1390 trees per acre. Portions of the lodgepole pine are standing dead or down dead due to past bark beetle infestation.

Lodgepole Pine

Mature lodgepole pine stands are scattered throughout the watershed at all elevations. Contiguous stands of mature lodgepole pine stands exist along Packsaddle Creek, in the upper elevations west of Packsaddle Lake, below Relay Ridge to Horseshoe Road, in the upper elevations of Twin Creeks and Mahogany Creek and the lower elevations between Patterson and Grove Creeks. Over half of this vegetation type has been surveyed and the data comes from stand exams and landsat imagery. Lodgepole pine is the main tree species with components of mature aspen in stands along the eastern edge of the watershed. Mature subalpine fir becomes a component of the stands as elevation increases. The understory is composed of subalpine fir seedlings, blue huckleberry, white spirea (*Spiraea betulifolia*), mountain sweetroot, pachistima (*Pachistima myrsinites*) and pine grass. The basic characteristics of the stands are average diameters ranging from 6.0 to 17.8 inches, ages ranging from 69 to 134 years, stand densities range from 176 to 1444 trees per acre. Many of these stands had mountain pine beetle infestations in the 1960's and early 1970's. These stands contain a lot of downfall due to beetle killed trees and windthrow.

Lodgepole pine seedling stands are located in the upper elevations north of Packsaddle Creek. All of these stands were clearcut between 1983 and 1990 and regenerated naturally from serotinous cones left after the logging operation. To prepare a seedbed, these units were scarified with a blade to 50 to 80% bare soil. Lodgepole pine is the main tree species with one inch diameters and heights of one to 12 feet. Some of the stands have a few subalpine fir seedlings that were left from the original stand. Most standing dead and down material were removed during logging and firewood sales. Stand densities range from 200 to 2958 trees per acre. These stands range in age from 7 to 10 years old. All of these stands have been surveyed and the data was generated from stand exams.

One **lodgepole pine sapling** stand is located in Murphy Creek. This unit has been surveyed and the data comes from stand exams. This stand was cut in 1970 and planted in 1976 and 1985. Lodgepole pine is the main tree species. There are 279 trees per acre ranging in diameters of 2 to 5 inches, heights of 10 to 30 feet and approximately 24 years old.

There is one known unit of **pole** size material and it was surveyed in 1980 generating the data. This stand is located in the high elevations north of Packsaddle Creek. Lodgepole pine is the main tree species with subalpine fir and blue huckleberry in the understory. This unit is approximately 130 years old with diameters ranging from 3.7 to 9.4 inches. Post and poles have been removed from this unit through personal use permits. Other post and pole size stands wxist in Grove Creek and Wood Canyon. Exact characteristics are not known as surveys have not been done.

Mixed 3 Conifer

Contiguous **mature mixed conifer** stands are located at all elevations in the Big Hole Mountains. These stands are predominant north of Packsaddle Lake, bordering the outside of Horseshoe-Packsaddle road, south of Mahogany Creek, and south and west of Patterson Creek. Many of these stands have been surveyed and stand exam data was used to determine the

following stand characteristics. The main tree species are lodgepole pine or Douglas fir with a subalpine fir component. The understory vegetation consists of subalpine fir seedlings, blue huckleberry, mountain maple, mountain sweetroot, and western meadowrue (*Thalictrum occidentale*). Standing dead and down material composed mostly of lodgepole pine are part of these stands. The basic characteristics of this vegetation type are diameters ranging from 6.2 to 19.5 inches, ages in the range of 87 to 197 and densities of 111 to 1329 trees per acre.

Aspen

Mature aspen stands are scattered throughout the watershed, but predominately at lower elevations (below 7000 feet). Most of the aspen stands are south of Mahogany Creek in the Big Hole Range with scattered patches within all the main drainages. A few of the mature aspen stands have been surveyed and the data was generated from stand exams and landsat imagery. The main tree species is mature aspen with some Douglas fir, subalpine fir or lodgepole pine intermixed within the stands. The understory species are aspen seedlings and saplings, mountain shrubs and blue huckleberry. Standing dead and down aspen is present in these stands. The attributes of these stands are a diameter range of 6.3 to 12.3 inches, ages ranging from 91 to 137 years and densities in a range of 113 to 895 trees per acre.

Forty five acres of mature aspen stands were treated to regenerate **aspen seedlings**. North of Henderson Creek, five acres of mature aspen were clearcut in 1980. A mature stand (20 acres) north of Pine Creek Pass Highway on the Forest boundary was cut in 1987. Fifteen acres of mature aspen north of Mahogany Creek was knocked over using a bulldozer in the fall of 1980 and about five acres of mature aspen was clearcut in 1981. All of these stands sprouted and are now one to five inches in diameter. Nine hundred and fifteen acres of sagebrush/grass/mature aspen were burned in Idaho Ridge, Dude Creek and Wood Hollow. A portion (amount unknown) are now aspen saplings.

Douglas Fir

Mature Douglas fir stands are in scattered patches at low elevations in the Big Hole Range. Additional stand exams would verify if more of this vegetation type may be present in the watershed.. The main tree species is mature Douglas fir combined with some mature aspen at lower elevations, or mature subalpine fir and lodgepole pine at higher elevations. The understory species consist of subalpine fir seedlings, blue huckleberry and grouse whortleberry (*Vaccinium scoparium*). Standing dead and down material exists in all of these stands. The dead trees are mostly lodgepole pine and subalpine fir. Pockets of mature dead Douglas fir are throughout the watershed due to recent bark beetle kills. The range of stand attributes are average diameters between 7.0 to 18.5 inches, ages between 87 to 136 and densities between 122 and 836 trees per acre. The data came from stand exams.

Englemann Spruce

Mature stands composed mostly of Englemann spruce are located in Dry Henderson, Patterson, Grove and Drake Canyons. The data used to characterized mature stands came from stand exams. Further inventories may identify more of this vegetation type. The main tree

species is Englemann spruce with mature subalpine fir as a major component. The understory consists of subalpine fir seedlings. Standing dead and down subalpine fir are part of these mature stands. The stand characteristics are diameters ranging from 11.8 to 17.5 inches, ages between the range of 97 and 177 years and densities that range between 185 to 455 trees per acre.

Old Growth

Old growth stands (1,732 acres) and old growth recruitment stands (881 acres) were identified through surveys within the watershed based on the Intermountain Region's guidelines (Hamilton 1993). See the old growth map (#XX) for the locations. The majority of old growth or recruitment stands are located between Dry Henderson and Patterson Creeks and north of Packsaddle Creek. There is a large cluster of aspen old growth in the Henderson Creek area. Further surveys may identify additional old growth or recruitment stands. The following are the minimum criteria used to identify old growth by species.

Table 3-6 Old Growth Characteristics

Species	DBH	Trees/Acre	Age
Englemann Spruce/Subalpine Fir	15	15	150
Douglas Fir	24	15	200
Aspen	12	10-20	100
Lodgepole Pine	11	25	140

In general the old growth stands have standing dead trees, a down woody component, multiple stories composed either from the underbrush or from subalpine fir in the lower canopy and a closed canopy (greater than 50% canopy cover). Most of the stands fall into the mature mixed 3 conifer vegetation type containing those attributes explained above. The Table 3-7 indicates the acres of old growth within each vegetation type.

Table. 3-7

VEGETATION TYPE	ACRES OF OLD GROWTH
Mature Mixed 3 Conifer	1,252
Mature Lodgepole Pine	771
Mature Aspen	307
Mature Mixed Conifer	135
Mature Douglas Fir	79
Mature Englemann Spruce	69
Total	2,613

Disturbances Associated With Forested Vegetation

Succession

Succession is divided into several stages as listed below. The definition comes from *Characteristics of Old Growth Forests in the Intermountain Region.* The items in italics were used to quantify the stands and to produce a GIS map (Map 9).

- Grass-Forb – grasses and forbs dominate the vegetation. Remnant snags and downed logs may be present in the stand.
- Shrub-Seedling – All stages of brush are present and tree seedlings and saplings are under 10 feet tall. Remnant snags and downed logs may still be present.
- Pole-Sapling – Trees are over 10 feet tall and less than 8 inches in diameter. An occasional dead tree or remnant snag is present.
- Young – Trees are over 8 inches in diameter and in a vigorous growth state. Few snags are present and most down material is small limbs and twigs. *The stand development stage is the lower limit of full site capacity and is measured by a stand density index (SDI) of less than 35 percent.*
- Mature – Trees have reached their height growth and crowns begin to widen. Climax tree species are evident in the understory, but large snags and down woody material is uncommon. *The stand development stage is the lower limit of self thinning and is measured by an SDI between 35 and 60 percent.*
- Old Growth (early phase) – Seral species comprise the overstory canopy with climax tree species of various sizes in the understory. Both climax and seral forbs, grasses, and brush are present in the understory. A few large trees are present as the seral species succumb to various pathogens. Evidence of insect, disease and fungi are present in the stand. Snags are developing and some large down woody material is present. Occasional small openings are present. *The stand development stage is between the lower limit of self thinning and the maximum site capacity and is measured by an SDI of greater than 60percent.*
- Old Growth (late phase) – The overstory consists entirely of climax vegetation. The understory contains various sizes of climax tree species. Large amounts of down woody material and snags exists due to seral tree deaths caused by pathogens and disturbance. Some living trees may have broken tops or rotting boles. The stand may appear very patchy with many small openings composed of seedlings, saplings and brush.

Mahogany Creek Watershed is composed of the following seral stages. This information is based on GIS data, stand surveys and interpretation of 1995 air photos.

Table 3-8 Seral Stages

SERAL STAGE	ACRES WITHIN WATERSHED
Grass – Forb	2,084
Shrub – Seedling	9,074
Pole – Sapling	460
Young	2,200
Mature	2,239
Old Growth (early phase)	27,598
Old Growth (late phase)	None Known

Fire

A fire history assessment attempted to provide insight into the fire frequency of this watershed. The assessment with limited information concluded the earliest event was in 1896 and the most recent was in 1991. Other fires occurred in 1901, 1927, 1921, 1933, 1943, 1966 and 1980. Fire intervals for samples taken from Douglas fir ranged between 10 and 26 years. The samples taken indicated fires were spatially and temporaly isolated disturbances. It is probable, but inconclusive from this assessment that the watershed has a more vigorous fire history and that some stands were established following large scale fire events preceding 1896.

The average fire season on the Targhee National Forest begins in early July and ends sometime between early September and late October depending on early snowstorms. It is not unusual for an early snowstorm to cause a presumed end to fire season, to be followed by two to three weeks of drying and warm temperatures causing a short return to fire season.

Based on fire records from 1960 to 1998, 30 fires have been detected and suppressed within the analysis area. Twenty-one of these fires were determined to be lightning ignitions and nine ignitions were attributed to human activities. The majority of these fires (22) were "A" class fires with only 8 falling into the "B" classification. The largest fire within the watershed was a 7-acre human-caused fire.

Table 3-9. Fire Occurrence (1960-1998)

Size Class	Lightning-Ignition	Human-Caused Ignition
A (< .25 Acres)	16	06
B (.25-9.9 Acres)	05	03
C (10-99.9 Acres)	00	00
Total	21	09

Fire occurrence data within the watershed prior to 1960 is more fragmented due to the changing boundaries of administrative units and missing data. Prior to 1960, data is incomplete or missing altogether. Review of historic Fire plans from 1911 to 1954 provide some useful fire data but is largely lacking in detail due to the absence of the original reference maps.

- 1954: No fires occurred within the watershed.
- 1952-53: Two man-caused fires within the watershed.

- 1941-1951: The 1951 Victor District Fire Plan indicates 18 fires burned within the district. The district boundary at this time in general coincides with the watershed boundary and also includes areas of the forest east to Teton Pass and north to Fox Creek. Of these 18 fires, 15 were "A" class fires and three were "B" class. It is noted that seven of the above fires were man-caused but it is not specified whether they were "A" or "B" class. This time period exhibits a somewhat greater fire occurrence than the 1960 to 1998 data block, averaging 1.8 fires per year. Also of interest is that all these fires occurred in July and August. It appears this fire season is typical for the watershed but fire season in extremely dry years can continue into late October and early November. It is noted that lighting ignitions appear to occur mainly on the high ridges and are evenly distributed over the district.
- 1931-1939: Fire occurrence maps for this time period indicate a total of four "B" Class and eight "A" Class fires occurring within the analysis area. Four of these fires were attributed to lighting and eight were associated with human activities. No "C" Class fires were recorded during this time period.
- 1940-1941: Incomplete Data
- 1923-1936: The 1937 Teton Basin Fire Plan notes this 10 year period had an annual occurrence of two to 15 fires with an annual average of seven fires on the Unit rather evenly divided between lightning, and human causes. During 1934, 1935 and 1936 a total of 30 fires occurred on the unit for an annual average of 10 each year. This figure included 21 Class "A", eight Class "B", and one Class "C". 1934-35 50 percent were lightning and 50 percent were man-caused. 1936 20% were man-caused and 80% were lightning. Burned acreage does not exceed 150 acres from 1921-1936. The area described in the 1937 Teton Basin Fire Plan coincides with the present day administrative boundary. Due to the lack of fire reports for this time period it is not possible to determine how many of these fires occurred within the watershed, however it does provide data to illustrate probable trends in the watershed.

Several high frequency fire years are identified in Forest and District Fire Plans from 1911-1955. These years include 1910, 1914, 1919, 1924, 1931, 1934, and 1949.
Prior to 1900 several narrative accounts relating to fire follow. These accounts are not quantifiable but do indicate that fire was a common disturbance agent during this time period.

- In August 1879 Thomas Moran was in Idaho Falls looking towards the Tetons and saw fires everywhere (Thompson & Thompson 1982). Thompson also reports in 1875, from the South Fork of Canyon Creek to the Middle Fork of the North Fork is all on fire and that the deer came down from the Mountains because of fires.
- DeLacey (1876) observed wildfires in August 1863 between Swan Valley, Idaho, and Jackson Lake. He described the landscape as being under a pall of smoke from fires burning north of Jackson Lake and noted that in summer, smoke from forest fires was common in the mountains (Gruell 1980).

The fire occurrence data from 1931 to 1998 exhibits a fairly low fire occurrence in the watershed cumulatively averaging .93 fires/year. Thirty-nine of these fires are " A" Class fires (less than 0.25 Acres) and 12 fires attained a size of 0.25 to 9.9 acres ("B Class). No "C" Class fires were recorded in the watershed during this time period. The data from 1931 to 1923, while not completely exclusive to the watershed, indicates a higher fire occurrence but the size

class distribution is very similar with the majority of fires falling into the "A" classification and only one fire being recorded as a "C" Class fire. The lack of "C" class and above fires throughout the fire occurrence data is surprising due to the nature of the vegetation and accessibility in portions of the watershed. Part of this can be attributed to livestock grazing of fine fuels, and the increased success of initial-attack crews due to the advancement of suppression technology, but the number is still surprisingly low.

During recent history it appears that small, low-intensity fires were the norm within the watershed. These fires appear to be fairly uniformly distributed with roughly 40% being attributed to human causes. The majority of fire activity occurs in July, August, and September and may well continue into late October in extremely dry years.

Prescribed Fire

Reference Condition
It is likely that fires were intentionally set within the watershed by Native Americans for ungulate habitat improvement and possibly warfare. The scale, frequency and vegetation types targeted by these activities are unknown. It is also probable that fires were started by trappers, settlers and soldiers from the early 1800's to the turn of the century. These fires burned unheeded unless a community was threatened. Due to the prevailing southwest wind pattern and the geographical location of the watershed, the impacts of large fires originating in the valley and moving upslope were in all probability less than what would be expected on the east side of the valley.

Current Condition
Data from previous prescribed fire activities is fairly current from 1981-1999. Prior to this very little information is available and what is available was obtained by talking to previous district personnel. The following information pertaining to prescribed fire activities in the analysis area is taken from previous burn plans currently on file.

- Idaho Ridge: 1996 to 1998 approximately 700 acres of sage/grass/ aspen were treated. Location: T5N R44E Sections 29&30, North of Horseshoe Creek near Idaho Mine.
- Dude Creek: 1995 approximately 150 acres of sage/grass/aspen were treated. Location: T5N R44 E Sections 19&20, Northwest of Dude Creek
- Dude Creek II: 1991 approximately 125 acres of sage/grass were treated. Location: T5N R44 E NW ¼ 19& NE ¼ 20.
- Woods Hollow: 1987 approximately 65 acres of mixed brush/aspen were treated. Location T5N R44E Sections 20&21, East of Dude Creek.
- Dude Creek: 1981 approximately 50 acres of sage/grass were. Location: T5N R44E Section 20 NE ¼.
- Packsaddle: 1980 approximately 200 acres of sage/grass/mountain brush were treated.
- Horseshoe: 1979 approximately 100 acres of sage/grass were treated.
- Mahogany: 1979 approximately 100 acres of sage/grass/ mountain brush were.
- Grandview: 1978 approximately 500 acres of sage grass were treated. Portions of this burn may have been partially within the watershed but the majority was not.

The majority of recorded prescribed fire activities in the analysis area have been concentrated in the Horseshoe/Packsaddle area. This is due in large to accessibility, fuel type and moisture regimes. Sage/grass vegetation types are more easily treated than forested types and are more readily accepted by the public. Approximately 1390 acres have been treated in this area from 1979 to 1999. The total number of treated acres for the analysis area is 1,490 acres. The acres treated prior to this time are unknown but were likely small-scale and confined to the sage/grass and mountain brush vegetation types.

The majority of successful prescribed burns in the analysis area have been implemented in the fall. Large burns conducted in spring have typically met with limited success due to higher fuel and soil moistures and a normally narrow "burning window". Burning conditions in the watershed can vary widely from year to year with occasional years presenting little opportunity for burning in spring or fall.

To date, no prescribed fires specifically targeting forested vegetation types have been implemented within the watershed. Continuation of full suppression responses to wildland fires and lack of prescribed burning in the forested areas of the watershed has resulted in steadily increasing fuel loads and stand densities. Correspondingly, the risk of larger and higher severity fires has continued to increase

Timber Sales

There has been 787 acres of timber logged using clearcuts and tractor logging systems within the watershed since 1980. Portions of three timber sales are within the watershed, Grandview I and II and Packsaddle Basin. Other areas in Mahogany Creek watershed were selectively logged or "high graded" during early settlement of Teton Valley. Most of the wood was used for building materials within the Valley and was milled on site. Most of the areas were logged in the winter using horses and sleighs (Targhee National Forest 1932). Early areas logged (noted during surveys or anecdotal reports) are: adjacent to the Sam townsite and coal mines during the mining operation, Smith Canyon, Mahogany Creek where three sawmills were located (pers. comm. J. Buxton 2000), north and south Twin Creeks, Henderson Creek (Fire Plan 1950-1955), Packsaddle Creek where a sawmill was located (Targhee National Forest 1932), Milk Creek, south Patterson Creek and Mine Canyon (pers. comm. K. Bagley 2000) stand 211/30 adjacent to Forest Boundary between Patterson and Henderson Creeks, 218/2, 218/6 between Henderson and Dry Henderson.

The Grandview II timber sale was cut between 1982 and 1988. The stands cut were composed of lodgepole pine, Douglas fir and subalpine fir and were 120 to 150 years old. All of the stands were clearcut resulting in evenaged stands composed solely of lodgepole pine seedlings. The cut stands do not follow the natural stand patteren.

The Grandview I Timber Sale was cut between 1984 and 1990. This timber sale cut 443 acres of lodgepole pine using clearcuts and tractor logging methods. The logged trees were 80 to 120 year old lodgepole pine. Much of the material removed was down logs (35 to 40 tons per acre) and snags (30 to 40 percent of the stands). The results are small patches of evenaged lodgepole pine seedlings.

The Packsaddle Basin timber sale cut 428 acres of lodgpole pine and Douglas fir between 1987 and 1993. The method of harvest was clearcut resulting in small patches of evenaged lodgepole pine seedlings.

Three other timber sales were proposed for the watershed in Wood Canyon, Smith Canyon and Superior Creek. These were never logged.

Other forest products such as firewood, post and poles have been harvested from the watershed since early settlement of the Valley. These practices removed dead standing timber and small diameter material (less than 7 inches dbh) from areas accessible to Valley residents. There were "farmer pole sales" in Grove and Drake Creeks which were cut in August and hauled out in the winter using sleighs (pers. comm. V. Bagley 2000). In recent years (after 1980), firewood has been gathered within 300 feet of all roads and in all the clearcuts.

Insect and Disease

Insect and disease infestations are a normal occurrence within the watershed and are a disturbance that can set succession back to earlier seral stages over a large landscape if the infestation is epidemic or over a small area where an endemic infestation kills a group of trees.

Mountain Pine Beetle infects lodgepole pine over 8 inches in diameter, greater than 80 years old and stands that have a density between 20 and 35 percent of maximum SDI. The beetles like warm, dry weather and a tree is more prone to attack if it is under some kind of stress. Frequency of infestations on a given area of forest appears to range from 20 to 40 years. (Baumgartner 1984) The mountain pine beetle has played an historic role in the perpetuation of lodgepole pine stands. The beetle periodically invades stands, creates large amounts of fuels in the form of dead trees which are eventually consumed by fire, creating favorable conditions for regeneration (USDA Forest Service 1990). Infestations have been documented on the Palisades National Forest in 1913, the Targhee National Forest between 1911 and 1915, 1930's, 1945 and 1970's (Alexander 1987) and in the watershed in early1980's (Timber Sale EA's).

In the 1930's the Forest controlled bark beetle infestations by felling, burning or peeling the infected trees. In the 1940's, foresters tried to eradicate bark beetles in the entire infested area by felling, decking and then burning the infested trees or spraying the trees with orthodichlorobenzene. Some tried to spray the infected trees with oil and then burn them. From 1960 to 1969, EDB (ethelenedibromide) was used to control bark beetles. (Alexander 1987) None of these methods were effective in controlling the bark beetle attacks due to the great extent of the infestations and the beetle had already damaged the tree.

"The bugging era" in the watershed and on the Targhee National Forest was from 1960 to 1967. Contractors would spray infected lodgepole pine with "goop", a mixture of EDB and diesel fuel (pers. comm. K. Birch 2000).

Currently in the watershed, endemic populations of mountain pine beetle exist attacking single susceptible trees. Conditions in 2,200 acres of lodgepole pine (successionally young stands) exist where an epidemic could occur. See Map XX for stands susceptible to beetle attack.

Douglas Fir Bark Beetle attacks stressed, large diameter (greater than 8 inches dbh) Douglas fir. It usually gets started in blowdown trees and builds up within two years attacking surrounding trees. The trees are usually drought stressed and beetle attacks are common during dry periods. No cyclic predictions can be made. 1996 surveys indicate scattered infestations of low severity in the southern portion of the watershed and along North Fork of Mahogany Creek. In 1998 small infestation of 20 trees was recorded in South Fork of Horseshoe Creek.

Western Spruce Budworm attacks Douglas fir, subalpine fir and Englemann spruce especially during dry warm weather. It prefers shade tolerant species, dense, multistoried stands and older trees. It usually attacks stagnated stressed stands that are in large continuous blocks. The larvae feed on expanding buds and new foliage, defoliating the tree. (Carlson 1983, Brookes 1987 Within the analysis area, heavy to moderate infestations of sprucebudworm were observed in 1985 aerial detection surveys; it defoliated most of the Douglas fir, Englemann spruce and subalpine fir in the watershed. Small endemic populations have been noted since 1985.

Subalpine Fir Mortality Complex affects mature subalpine fir and may be related to stress and bark beetle attacks. The Forest Health and Pest specialists are unsure of what is causing mortality in subalpine fir but think it maybe due to an increase in subalpine fir in the ecosystem becase of succession and lack of fire. One theory states the trees became stressed after a sub-artic cold event in the winter of 1991/1992; this was followed by a drought, which lead to tree mortality. Aerial detection surveys throughout the 1990's noted scattered pockets of dead alpine fir in the upper elevations of the watershed, major (greater than 70 trees in a group) mortality occurred on Maytag's private land, along the north fork of the South Fork of Packsaddle Creek and at the head of Superior Creek.

Dwarf mistletoe is a parasite on lodgepole pine and Douglas fir and is the most widespread and frequently observed disease within the Intermountain Region. These infections reduce height and diameter growth, reduce wood quality, decrease seed production and vigor and may eventually kill the host tree or predispose the host to secondary infestation by insects. All ages of trees are susceptible to attack. Heavily infested trees are more susceptible to fore and aid in fire spread. Fire can effectively limit spread of dwarf mistletoe by eliminating sources (Hawksworth 1996). Mistletoe is probably more widespread now than it was historically due to increase in mature age classes and decrease in moderate severity fires.

Other Disturbances

Avalanches are most common within the mixed conifer vegetation types on the steeper, high elevation slopes below Relay Ridge and affects subalpine fir. Small patches of windthrow have been noted in the watershed on the windward side of most of the clearcuts, in a dense stand of lodgepole in Murphy Creek and in a mature lodgepole stand in Patterson Creek. Both of these disturbances create snags and down woody material.

Patch Size

The forested vegetation seems to be in similar patch sizes as historically except where humans have had influence. Generally, the forested vegetation is found in the following areas: subalpine fir on north slopes, mixed conifer dominated by subalpine fir and Douglas fir on northeast slopes, mixed conifer dominated by Douglas fir and lodgepole pine on the southeast slopes, lodgepole pine on the rolling mountain tops and aspen on the lower elevations on the southeast slopes (EA for Grandview I timber sale). Forest has been fragmented where roads and trails have been built through timbered areas and where small amounts of selective forest product gathering has occurred. Major differences in patch sizes have occurred where clearcuts were logged decreasing the patch size of lodepole pine stands and where agriculture and housing developments have changed the patterns and vegetation types. For example, areas along the Forest boundary in Horseshoe Canyon were once aspen stands and are now plowed fields and houses.

REFERENCE AND CURRENT CONDITION FOR NON-FORESTED VEGETATION

This section of the watershed analysis includes the reference and current conditions of the non-forested vegetation. The non-forested area is broken into five communities, riparian, mahogany shrub, mountain shrub, sagebrush/grass and tall forb/grass. The timeframe selected for reference condition is pre 1880, before European Americans settled in this area and grazed cattle and sheep.

Riparian Communities
Reference Conditions

Riparian communities are based on vegetative associations at equilibrium with existing soil and water characteristics. Soil and water characteristics commonly change in riparian settings, especially where lateral stream migration and vertical stream cutting occur. Many riparian communities, especially those in arid portions of the west have been floristically altered by heavy livestock grazing (Parget 1989).

Historical information and photography of riparian conditions, plant community composition and diversity is limited in the west and particularly lacking in the Watershed. For Teton Basin in general, some photos of Teton Canyon from the Hayden expedition and diary entries from trappers at the rendezvous of 1829 and 1832, and those of Beaver Dick, give a little information of pre-settlement conditions of the riparian areas in that they describe large areas of willows and “swamp grasses” along various creeks and the Teton River.

Beaver dams, both active and old, in the small drainages provided a wide variety of water and soil conditions that favored a variety of Carex dominated sites and willow complexes. Stream banks were dominated by a variety of Carex species, willows, wetland grasses such as tufted hair grass and *Poa palustrus*, gooseberries, alders, red-

oshier dogwood, rose species, spruce, and cottonwoods. Stream banks were predominately stable due to the amount of large woody materials in the stream, and the deep root masses of these species especially the Carexes.

Current Conditions

The total number of acres of riparian vegitation in this watershed is unavailable. Most of the riparian areas in this watershed are very narrow, often less than 50 feet. The few exceptions to this are the carex meadows around Packsaddle lake, the willow community in Little Pine Creek and its tributaries, the willow community in Mahogany Creek, and the willow and moist meadow community in Horseshoe Creek. These areas are often 200 feet wide or more.

Carex communities on streams in the watershed include *Carex urticulata* (rostrata), *Carex aquatilis* and *Carex microptera*. Other aquatic sedges such as *Carex lasiocarpa* and *Carex simulata*, which were historically present, are rarely found. These complexes are limited to patches on the edge of the stream banks and patches in willow communities. Interspersed with Carex communities are more shallow rooted species such as *Poa pratensis*, *Agrostis stolonifera* and *Phleum pratensis* on a lot of the stream reaches.

Wet meadows and spring areas changed floristically with grazing. Species more tolerant of grazing such as *Potentilla gracilis* and *Aster integrifolius* have increased, other species such as *Carex lasiocarpa* and *Carex simulata* have decreased or disappeared from the plant community.

The riparian steam corridors in the Mahogany watershed have had a decrease in overall plant diversity where concentrated grazing has occurred. *Poa pratensis* and *Agroseris stolonifera* (Red top) have replaced much of the native grass species in abundance. Introduced grasses such as Timothy and Smooth brome and noxious weeds such as Canada and Musk thistle have also increased in the riparian areas. *Ribes hudsonianum* and *Carex microptera* association has become dominate in some stream reaches.

Community types on the streams vary by narrowness of the reach and by the gradient. Willow complexes vary depending on the stream and the reach. Available information specific to the creeks is listed below.

Packsaddle Creek - The main stream below the confluence of the South and North forks is primarily forested with spruce/red-osier dogwood community type (ct) on the terraces and a thinleaf alder/willow and red-osier dogwood complex along the stream edge. Narrow leaf cottonwood and coyote willow occur in patches. The North Fork is primarily spruce/red-osier dogwood with thinleaf alder and Hudson Bay current in streamside areas. The South Fork is a mix of community types with spruce/red-osier dogwood, subalpine fir /lady's bedstraw, spruce/common horsetail, and Booth's willow (sic blueberry willow)/horsetail or Kentucky bluegrass or beaked sedge in the wider

reaches. Exotic and noxious plant species such as Canada thistle and common Timothy are also present.

Henderson Creek- It is forested along narrow reaches with spruce/red-osier dogwood or rocky mountain maple/lady's bedstraw communities. The open reaches are vegetated with thinleaf alder/Hudson Bay currant and adjacent areas have exotics such as Kentucky bluegrass and Timothy grass, native increasers such as coneflower and noxious invaders such as musk thistle and Canada thistle. The area was seeded in 1993 and 1994. Roads, cattle trails and concentrated grazing are causing erosion in this creek.

Horseshoe Creek - In the South Fork, willow types dominate the lower reach, alder types are in the upper reach. The Main Fork is dominated by willow/horsetail types.

Mahogany Creek – The north fork has a small beaver dam in Booth's willow and Geyer's willow/beaked sedge communities. The upper reach is forested with spruce/red-osier dogwood or common horsetail and thin leaf alder. The upper reach of the South Fork is dominated by mountain bluebell/senecio and a mix of trees, shrubs and forbs. The mid reach is 50 percent spruce/dogwood, with the rest in alder, willow, forb and spruce types. The lower stretch is spruce/dogwood, with other stretches of alder and willow types. From the confluence of the north and south forks down are complexes of willows with beaked sedge or Kentucky bluegrass. Old dam blowouts are sparsely vegetated and musk thistle is heavy in the lower canyon. There are some cottonwood habitats scattered in the lower canyon.

Historically there would have been more beaver activity. They would have kept the dam complex in better repair, which would have supported a carex community more like the one described in the historical condition narrative. The existence of exotic and noxious weeds has been furthered by historic grazing practices, the dam blowouts and by the drop in the water table. Over the last 15 years the condition of the riparian area has been improving.

Murphy Creek – There is a stark contrast in the stream area between the ungrazed and grazed portions of this creek, which is divided by an allotment fence. The grazed riparian vegetation is primarily Booth's and Geyer's willow with exotics such as Kentucky bluegrass and timothy at the allotment boundary. The upper reaches are a complex of aspen and mixed shrub grading into spruce. There is a tall forb component in the ungrazed area that dose not occur in the grazed areas.

Mahogany Shrub Community

The curl-leaf mountain mahogany community type occurs from Mahogany Creek south on limestone ridges. Most of the mahogany type occurs between Mahogany and Henderson Creek. Small patches occur at the upper elevation from Murphy to Pole Canyon but only consist of a few trees.

Reference Condition

The environmental strategy that mahogany uses to survive in an area that has a reoccurring fire interval such as this one is avoidance. It survives in the rocky areas that the fire can't reach. Davis (1991) found that the older trees in the mahogany community occur in rockier sites more protected from fire and where it is easier to reestablish. Observations in the Big Hole Mountains and the Teton Mountains also show this pattern. With a more historic fire interval the patch sizes in this community would be much smaller, probably with just a few trees on some of the more rocky areas.

Air photo comparisons from 1943 and 1995 help support this theory. In some instances the patch size of the mahogany increased significantly in these 52 years. This was noted in the Mahogany Creek drainage. There appears to have been a reduction of large Douglas Fir and mountain brush on some south aspects. The mahogany has expanded into some of these areas. The reason for the reduction of timber and brush is not known. Other stands in this drainage have increased in size. Where only a few mahogany trees are visible on the 1943 photos there are many more trees and an increase in patch size on the 1995 photos. This was also noted in Dry Henderson. On the south slopes, from about half a mile up from the forest boundary, continuing for at least a mile, there are mahogany tree stands mixed with the mountain shrub. The 1943 photos do not show near the mahogany presence that is on the 1995 photos or as reported from field observations (Ovard 1999). An ocular estimate of the acres of mahogany in the 1943 photos is at least 20 percent less than the acres found in the 1995 photos.

The percent canopy cover has increased in most of the stands. Where there are a few scattered trees on the 1943 photos there are often dense stands in the later photos. The patchy mahogany found on both sides of the forest boundary between Mahogany Creek and Dry Henderson have not increased in size but the canopy cover is much greater.

The understory has changed in many of the mahogany stands. The 1943 photos indicated a shrub or brush component in the area corrently occupied by the larger mahogany stands.

Current Condition

Curl-leaf mountain mahogany stands have increased in numbers, patch size, height and canopy cover since the 1940's. There is currently 487 acres identified in this watershed. The deer have hedged, or high lined the trees to the point that there is little available browse. Ovard (1999) found in North Mahogany Creek, Henderson Creek and in Dry Henderson that sprouting on lower portions of stems has occurred over the last two years and no browsing has occurred. The understory has changed in many of the stands. The 1943 photos indicated a shrub or brush component in the area currently occupied by the larger mahogany stands. This shrub component is absent or reduced in the in the 1995 photos. The antelope bitterbrush in the under story has decreased since the 1970s (Whitfield 1999). Whitfield found that browse transects set up in the 1950s in predominantly bitterbrush communities had little or no bitterbrush in the late 1970s. This species composition change may be due to the increase in canopy cover and the corresponding increase in shade or it may be due to competition for water and nutrients.

Large seed crops in mountain mahogany are common, seedlings reestablish stands and they sometimes advance into other community types with fire suppression (Knight 1994). No mahogany seedlings or young plants were found within the stands. Mahogany has a low sprouting response to fire. Mahogany has a lack of lower adventitious bud (Thompson 1990) accounting for few to no plants

sprouting after fire and the low number of basal sprouting found in the stands after fire. Seed germination rates with time have been measured from 63 to 80 percent for up to 15 years and drop from 44 percent to 28 percent from 20 to 25 years (Stevens 1994). The symbiotic relationship with nitrogen fixing Frankia bacteria could be important in the recovery of sites after a fire (Paschke 1997). Creating change in old stands can prove difficult. Though some success has been shown with pruning, it is basically impractical for increasing production (Davis 1991). Davis (1991) suggest that the best overall method of treatment in old communities with browse out of reach would be to thin trees in small and random openings creating habitat for other browse species and provide sites for establishment of new mahogany seedlings. A soil lacking nitrogen is required for best regeneration. If restocking an area is desired, sites with little or no topsoil, a close and abundant seed souce and no vegetation will have the greatest success.

Mountain Shrub Community

The mountain shrub community is found throughout the watershed on both north and south facing slopes.

Reference Conditions

The mountain shrub community consists of two types. On North to easterly facing slopes, rocky mountain maple, mountain ash, huckleberry, birchleaf spirea, mountain lover, snowberry and shade tolerant grasses and forbs such as bear grass and columbine dominate the type. This type is early successional in forested communities and becomes the forest understory community, with various species dominant depending on canopy cover. As the forest matures and areas open up with loss of trees this community dominates the opening.

On south facing and east slopes the community is dominated by serviceberry, chokecherry, snowberry, antelope bitterbrush, mountain lover and mountain big sagebrush, blue bunch wheat grass, Nelson's needle and thread and arrowleaf balsamroot. The structure of this community is dependent on the fire interval.

Beaver Dick Leigh lived in the area around 1875 described the brush areond Grandview Point as so thick that to get a shot at game he utilized dogs to flush them out. A comparison of 1943 and 1995 aerial photos was done to provide historical context. The results are: mountain shrubs were more prevalent on the north slopes in 1940's; these areas are dominated by an overstory of conifers today. There was less Douglas fir and aspen on the south slopes in the 1940s and the mountain shrub communities were larger then.

Current Conditions

The mountain shrub communities are composed of the same species as mentioned in reference condition. There are currently 6,227 acres of this community type in the analysis area. The successional stages and age class have shifted to late successional and mature age classes and there has been a reduction in patch size due to increases in Douglas fir and aspen on the south facing slopes. The main reason for this shift is the loss of fire in the last 50 to 100 years. Some areas (365 acres) were burned in the last 10 years and early and mid successional shrubs are found in there.

This community is found predominantly on the south slopes and is an element of primary winter range for wildlife. Serviceberry and antelope bitterbrush get the highest use and are the primary forage for big game species during the winter months.

Sagebrush/Grass Community

The sagebrush/grass community type is found mostly from Horseshoe Creek North. Small areas are found south of Horseshoe Creek but are in mixed association with the mountain shrub community.

Reference Condition

This community type was extensive in Teton Basin until Eurpean settlement. Beaver Dick Leigh described the area as sagebrush grassland, cottonwoods and aspen, with willow bottoms on the streams. Most of this community was on private land but a portion of this community was found on the forest north of Horseshoe Creek. Sage/grass was found on hillsides with a southern aspect, often mixed with mountain brush and on ridges with broad relatively flat tops and in some flat meadow. The hillside community had bluebunch wheat grass and Idaho fescue in the under story along with arrow leaf balsomorhiza. The sagebrush on the flatter sites had little or no mountain brush except for snowberry, a minor component. The under story included bluebunch wheat grass and Nelson's needle and thread.

Current Condition

Most of the sage/grass community found on private land has been changed to houses, hayfields and cropland. The community still occurs Horseshoe Creek north. Patch size has not changed much since the 1940s, due to the soils. There is currently 3,993 acres of sage and sage/grass in the analysis area. Grazing has decreased the plant diversity and species composition. There has been an increase in introduced species such as Kentucky bluegrass and increaser forbs such as coneflower and dandelion. The sagebrush canopy cover and plant size was less in the 1940's (comparison of 1943 to 1995 air photos).

Today the mountain sagebrush community is in a late seral stage. Shrubs are showing decadence, such as dead stems. Mountain sagebrush has a higher percent of the cover than is normal if fire were in a more historic cycle. Snowberry cover is high and most stands are greater than 30 percent shrub cover for sagebrush. Douglas fir has increased in these sites since the 1940's but only as scattered trees. Sagebrush in early seril stage are found in burned areas (1,335 acres).

Grass/Forb Communities

Reference Conditions

Grass communities occurred on ridgelines and mountain crests on soils generally of coarse materials. These sites were dominated by bunch grass species, predominantly blue bunch wheat grass and Idaho fescue.

Tall forb communities occurred on south and southeast aspects at higher elevations on more productive sites. These communities included late seral forbs such as fireweed, sticky geranium, Lomatium and

yampa. Grass species included California brome, onion grass and a Hood's carex. The highest elevations such as Relay Ridge, contained a large forb component.

Current Conditions

There is currently 913 acres of this community found in the analysis area. These areas have changed floristically primarily by sheep grazing (Winward 1998). Current flora is different than the original flora in species composition and plant dominance. The species changed from the dominant species listed above to an early seral stage that includes coneflower and mule's ear. From the turn of the century to about 1940 there were about 10,000 sheep in this area for at least part of the growing season. There was a drop in the range condition from this over use and a drop in the soil productivity from extensive erosion of topsoil.

In the early 1940s, the Forest Service and the stock owners started a trend to lower stocking rates, shorten seasons of use and enlisted more scientific grazing practices that halted the decline of the range condition and started an upward trend that had dramatic effecton nonforested vegetation. This has continued through today. Data on range condition over the last 20 years is not available but stocking rates are at historic lows and seasons of use have not increased. Considering this, the range condition has been stable or has improved.

Distrubances Associated With Nonforested Vegetation

Grazing

Grazing has affected non-forested vegetation throughout its existence. Since European settlement cattle and domestic sheep have replaced bison and bighorn sheep as the major herbivores. Due to larger herd sizes, pasture fences restricting movements, years of breeding without predators resulting in more sedentary habits, yearly grazing, and dependence on water, cattle grazing has had impacts on riparian areas and adjacent uplands. Domestic sheep prefer forb and browse species but will use grass. With a herder present, flocks are moved around and better distributed than cattle. Following is a discussion of the grazing allotments within the watershed.

Stock use of the watershed started in the 1890s, ten or more years before the Targhee National Forest was formed. At this time the forage was used on a first come, first serve basis. The number of animals on the range at this time is not known but there were no stocking rate restrictions and the available forage did not meet demand. There were no starting dates or ending dates. It was a race to get to the best forage. This system did not promote conservation. Any forage left by one stockman was utilized by the next. Once stock use exceeded the ability of the range to sustain itself forage harvest was replaced with forage "mining". This over use changed the plant species composition and decreased plant cover, exposing soil to the elements. This in turn increased erosion and further reduced the ability of the land to produce forage.

Upon the creation of the Targhee National Forest, stocking rates and season of use dates were set. Though these dates and numbers were generous by today's standards the process of conservation was started. Range management changes, with the corresponding improvement in range condition, directly benefited the rancher. From this point to current, the general trend over the watershed has been for shorter seasons of use and for reduced stocking numbers. Sheep use has gone from a 10,000 sheep (conservative estimate) in the 1940s with a season of

use of up to 6 months to 4,400 head in a season with many of these spending only a portion of their time in the analysis area. These reductions in numbers and season of use, coupled with stricter herding requirements that limit the time a band of sheep can stay in any area, has resulted in a dramatic increase in the range condition over the entire watershed. The acres and range condition ratings over the years are included with the summary of each allotment. Map XX shows the location of each allotment discussed below.

Packsaddle Allotment is a cattle and horse allotment with current use from 6/15 to 9/30 and one permittee grazes 130 head.

This is the northern most allotment in the watershed, lower in elevation, less steep, with a lower more rounded ridgeline than the rest of the watershed.

Use by domestic livestock probably began in the 1890's and was one of the first to be grazed by domestic stock. For the 25 years prior to 1936, this allotment was used by 1500 sheep and 300 to 500 cattle. In 1936, the cattle numbers were reduced to less than 100 head and the sheep to 1090 head.

Since 1925, the allotment has been used by 25 different permittees, often by multiple ranchers in grazing associations. In 1945 the sheep ranchers were restricted to grazing over the allotment only once a season. This allowed the plants to recover some of their vigor and to produce seeds most years. Since 1961 the allotment has been in a five-pasture rest rotation grazing system where one pasture is rested each year. In 1981 the allotment was converted to strictly cattle with a stocking rate of 130 head.

The earliest range condition information is from 1951 and 1963 when Packsaddle allotment was still combined with Horseshoe allotment.

Range Condition for Horseshoe-Packsaddle

Condition Class	1951	1963
Excellent	0 Acres 0%	276 Acres 3%
Good	3,200 Acres 29%	5,766 Acres 65%
Fair	6,535 Acres 60%	2,225 Acres 25%
Poor	1,220 Acres 11%	564 Acres 6%
Total Acres	10,955	8,831

Range Condition for Packsaddle

Condition Class	1967	1971
Excellent	0 Acres 0%	0 Acres 0%
Good	3,483 Acres 83%	3,353 Acres 78%
Fair	698 Acres 17%	875 Acres 20%
Poor	0 Acres 0%	94 Acres 2%
Total Acres	4,181	4,322

Horseshoe and Twin Creek Allotment is a sheep and goat allotment with Current use from 6/16 to 9/20 and one permittee grazes 1200 head.

Use by domestic livestock probably began in he 1890's and was used by sheep and cattle. The Horseshoe allotment has been combined with other allotments through the years. Originally the Horseshoe allotment included the Twin Creeks allotment. In 1928, the Twin Creek drainage was dropped and the South Fork of Horseshoe was used as part of the Warm Creek Sheep and Goat allotment. In 1936 all the Horseshoe Creek drainage and the Packsaddle Basin unit were combined to form the Horseshoe allotment. From 1944 to 1973 the Horseshoe and Packsaddle allotments were combined. In 1973 Horseshoe and Packsaddle were again split and Horseshoe was combined with Mill Creek and Table Rock pastures in the Teton Creek drainage.

Season of use was 6 months from 1909 to 1923 and was grazed by 1800 cattle and 3000 sheep. It was reduced to 5 ½ months from 1923 to 1939 and grazed by 200 cattle and 1500 sheep and further reduced to 4 2/3 months in 1940, grazed by 50 cattle and 1050 sheep. Currently 1200 sheep enter the Horseshoe allotment on 6/16 and graze until 7/30; they then move to the west slope of the Tetons for the remainder of season. No cattle are permitted on the allotment.

Reduced season of use and reduced numbers along with scientific range management have greatly improved the range condition on this allotment as shown by the range condition data below.

The range condition information from 1951 and 1963 is found in the Packsaddle allotment information above.

Range Condition Data for Horseshoe

Condition Class	1967	1971
Excellent	276 Acres 6%	247 Acres 6%
Good	2,283 Acres 49%	2,445 Acres 55%
Fair	1,579 Acres 34%	1,149 Acres 26%
Poor	512 Acres 11%	468 Acres 11%
Total Acres	4,650	4,401

Range Condition Data for Twin Creek

Condition Class	1955
Excellent	0 Acres 0%
Good	200 Acres 5%
Fair	3,185 Acres 87%
Poor	290 Acres 8%
Total Acres	3,675

In 1967, district ranger Richard Heninger, stated that the "forage was in excellent condition" and the trend map in 1968 indicated that 90 percent of the allotment was in good or excellent condition.

Mahogany Allotment is a Cattle and Horse allotment with no use since 1997. Prior to 1997 there was use from 8/1 to 9/15 and one permittee grazed 20 head. This allotment has been

grazed heavily in the past by both sheep and cattle. The records show a substantial amount of grazing trespass occurred on the west side of the allotment in the early years. Actual use data is lacking.

Prior to 1930, common use was practiced mainly on Mahogany ridge and Twin Creek ridge areas. The season of use has fluctuated between 2 ½ and 5 months. Maximum allowable number of cattle was 100 head in 1926. There has been little change in the boundary since the allotment was established. In 1940, sheep were excluded from the canyon bottom.

The suitable cattle range in this allotment is very limited. It is found in the creek bottom and on some of the less steep hillsides. A note from 1963 was found in the allotment folder that stated "all the grass in the creek bottom was used". Over the last 12 or 15 years there has been little use of this allotment. The permittee would use the allotment one year and not stock it at all for two or three years. This was repeated two or three times until he finally relinquished the permit due to non-use. It is feasible to combine this allotment with the Twin Creek allotment as an additional pasture in that rotation.

Range Condition Data for Mahogany

Condition Class	1952	1963
Excellent	0 Acres 0%	173 Acres 32%
Good	0 Acres 0%	362 Acres 68%
Fair	360 Acres 100%	0 Acres 0%
Poor	0 Acres 0%	0 Acres 0%
Total Acres	360	535

Red Mountain Allotment is a Sheep and Goat allotment with Current use from 6/16 to 9/20 and one permittee grazes 1200 head.

A small portion of the allotment, from Rocky Peak to highway 31, is in the watershed. This allotment has had many permittees ranging from co-op herds with many ranchers combining their small herds to times when there was only one permittee on the allotment. There was no grazing from 1985 to 1989.

The season of use and the stocking rate have dropped from historical numbers though not as drastically as in some allotments. Until 1930 this area was common range. From 1930 to 1936 there were about 1600 head of sheep assigned to this allotment. From 1936 to 1941 this was reduced to 1325 and to 1200 after 1941. The season of use from 1936 to 1941 was three months, from 1941 to 1966 was 2 ½ months and after 1966 it is two months.

Range Condition Data for Red Mountain

Condition Class	1951	1966	1970	1972
Excellent	0 Acres 0%	1,218 Acres 41%	1,206 Acres 41%	1,580 Acres 40%
Good	337 Acres 9%	58 Acres 2%	48 Acres 2%	488 Acres 12%
Fair	2,953 Acres	1,795 Acres	1,663 Acres	1,897 Acres

	81%	56%	56%	48%
Poor	345 Acres 9%	0 Acres 0%	0 Acres 0%	27 Acres 1%
Total Acres	3,635	2,971	2,971	3,979

Westside Allotment is a cattle and horse allotment with current use from 6/19 to 9/30 and one permittee grazes 130 head.

Grazing prior to the establishment of the Targhee National Forest was by all classes of livestock on a first come, first serve basis. The stocking rates and the season of use have decreased over the history of this allotment.

This allotment was classified as common use range, which means both cattle and sheep can use the same areas of the allotment. In 1920 the obligation was for 675 head of cattle and horses from 5/15 to 10/31 and two bands of sheep (3000 ewes) from 6/16 to 10/15. In 1921, actual use of cattle was reduced to 168 head with sheep numbers staying the same but having a season of 6/1 to 9/30. The allotment was converted to cattle in 1946. In 1964 the cattle numbers were reduced to 130 head and the season of use was 3 months. The range was very degraded. A five pasture rest rotation pattern was implemented which rested a different pasture each year to allow the forage to recover some of its vigor and to set seeds. By 1983 the range had recovered very well. The rest rotation was replaced with a five pasture deferred rotation. This doesn't allow for a rested pasture.

The trend over the years between 1920 and 1984 showed an increase in the condition of the range. There has been no range condition data collected since 1975 but the information from the allotment folder indicates that the recent trend may not be as promising. Henderson Creek was reported as being over grazed from 1984 to 1989 and in 1992 it was reported that the vigor in the shrub community has dropped.

Range Condition Data for Westside

Condition Class	1952	1964	1975
Excellent	0 Acres 0%	578 Acres 19%	916 Acres 29%
Good	350 Acres 13%	1,304 Acres 42%	1,265 Acres 41%
Fair	1,200 Acres 46%	1,225 Acres 39%	926 Acres 30%
Poor	310 Acres 12%	0 Acres 0%	0 Acres 0%
Total Acres	2,615	3,107	3,107

Pine Creek Allotment is a cattle and horse allotment with current use from 6/15 to 9/30 and one permittee grazes 53 head of cattle.

This allotment is found at the south end of the valley, just east of Highway 31. It is a small allotment when compared to the others. Prior to 1937, this allotment included three allotments; Head of Rainey, the Red Mountain and the lower parts of the Upper Pine Creek. During the period of 1937 to 1940 the boundary was reduced to what it is today.

Before the current boundary was established this allotment was used by 3675 sheep in three bands and had 700 head of cattle. Before 1922 the cattle grazing period was 5/1-10/31. From

1922 to 1940 the season of use was changed to 5/16 to 10/31 and in 1940 was shortened to 5/21 to 10/20.

Until about 1930 or later, the use by permitted cattle form Teton Basin accounted for approximately 50 percent of the allowance for the allotment. By mid season 400-500 head of Swan Valley cattle had drifted onto the allotment bringing the total cattle to well over 1,000 cattle. Following 1930 the local demand for cattle declined and in 1938 the allowance was reduced to the present capacity. At this time the drift from nearly all Swan Valley stock was eliminated. By 1940 a considerable reduction in sheep use was obtained through fewer numbers and shorter grazing periods. The allotment was converted to cattle around 1950.

The reduction from a high of 3675 sheep and over 1000 cattle using the range for 6 months to the current level of 53 head of cattle for 3 ½ months accounts for the shift in range condition from fair to good over the years from 1951 to 1975.

Range Condition Data for Pine Creek

Condition Class	1951	1975
Excellent	0 Acres 0%	0 Acres 0%
Good	170 Acres 10%	1,169 Acres 79%
Fair	1,400 Acres 84%	314 Acres 21%
Poor	96 Acres 6%	0 Acres 0%
Total Acres	1,666	1,483

Head of Rainey and West Burbank Allotment are sheep allotments with current use from 7/1 to 9/30 and one permittee grazes 1100 sheep.

Prior to 1924 the main sheep driveway crossed the center of this allotment via the Big Ridge to Counting Corral at the Forest Boundary on the Pine Creek Road. This driveway was used annually by up to 40,000 head of sheep for entering and leaving the range. The Head of Rainey allotment was part of the Pine Creek allotment until 1937.

The only information found on the range condition of this allotment was from 1952. Of the 1491 acres in this allotment that are used, 15 percent was classed as good, 52 percent as fair, and 33 percent as poor. Current data is not available but the condition over the last 47 years has increased significantly.

East Burbank Allotment is a sheep allotment with current use from 7/1 to 9/30 and one permittee grazes 1100 sheep.

This allotment was grazed by the Hunt brothers prior to creation of the Forest. They ran 13,500 head of sheep, feeding all along Corral Canyon, Fogg Hill, and Dry Elk. This allotment was part of the sheep driveway and had as many as 40,000 head trailed across in a season. Over the years this number has been reduced to one band of 1100 sheep and the season of use is now only 3 months.

The only information found on range condition was from 1952; 19 to 37 percent of the allotment was in good condition, and 63 to 81 percent of the allotment in fair or poor condition. There has been a significant increase in range condition over the last 47 years.

Fire

Fire has played an important role in maintaining nonforested vegetation communities. The following description is adapted from Bradley (1992).

Nonforested vegetation falls within fire group zero.

Sagebrush is not a fire resistant species and is easily killed by wildfire. Mountain big sagebrush stores seeds in the soil, which germinate as a result of fire-induced heating. Fire intensity affects the rate of re-establishment by changing viability of the seed bank. Future fires in these stands could be of high intensity due to cover and fuel loads. Depending upon climatic conditions and grazing patterns, sagebrush usually requires 20 to 40 years before returning to pre-fire levels. .

Antelope Bitter Brush forms a symbiotic relationship with bacteria which could contribute to this species ability to pioneer natural and human disturbed sites (Righetti 1983), recover following fire (Paschke 1997) and it's ability to recover from browsing and persist under long duration of close hedging. Bitterbrush grows in a wide variety of habitats over a large range. Genetic variability allows for wide ecological amplitude. This variability may also contribute to the plants high variability of response to fire, specifically to fire intensity, season intervals, fuels buildup, soil moisture, and soil type (Martin 1983). In general it appears that low intensity fires at cool temperatures and good soil moisture are conducive to the plants sprouting. The decumbent form of bitterbrush found in our area is more likely to sprout after fire. When associated with big sagebrush, adaptation to fire intervals of 10 to 40 years is predicted (Winward 1991). With these fire intervals, younger stands are more likely to sprout after fire than decadent stands with fuels buildup. Decadent stands will be more susceptible to loss through wildfire. Germination rates after 20 and 25 years were 84 percent and 74 percent respectively (Stevens 1994), indicating a good seed bank would be available with predicted fire intervals allowing new seedlings as well as spouting as long as fire severity was not too high. Harper and Buchanan found bitterbrush declined with increased canopy cover of coniferous trees and attendant shading. Loss of bitterbrush in mahogany stands could also be related to shading.

Service Berry is well adapted to fire. It has deep buds and is a prolific sprouter after fire. Noste (1989) found that fire severity had little effect on sprouting. Seed germination was found to be 76 percent after 15 years but dropped to one percent after 20 years (Stevens 1994).

Most grasses and forbs sprout readily and dramatically increase their abundance following a fire.

Fire history for this fire group is generally lacking. Barrett (1994) estemated a mean fire return interval of 19 years for sagebrush/grasslands and mountain brush on the Caribou National Forest in southeastern Idaho. The historic fire return interval has been estimated to be 20 to 40 years for mountain big sagebrush on the Caribou National

Forest, and 10 to 30 years on the Bridger Teton National Forest (1998). The historic fire return interval for mountain brush is generally considered to be similar to the mountain big sagebrush sites.

Over the last 20 years about 1,335 acres of sagebrush/grasslands have been treated with prescribed fire. Most of this has been done in two areas: Idaho Ridge between Horseshoe and Packsaddle creeks has had about 700 acres burned from 1996 to 1998 and Dude Creek, east of Idaho Ridge, has had about 300 acres burned. The objective of these fires was to improve big winter range by increasing the diversity of age classes in this community.

WILDLIFE REFERENCE CONDITIONS

The timeframe selected for reference condition was prior to 1880 before a concentrated permanent European settlement began to rely on the nearby resources for survival.

Introduction

The following historical accounts document the presence of various wildlife species.

Trappers were drawn into Pierre's Hole in the early 1800's. Osborne Russell (1834) found Pierre's Hole to be a beautiful valley, with grass and herbage abounding with buffalo, elk and deer.
Donald MacKenzie described the wildlife in the area in 1818. He noted "red deer" on the plains, beaver, otter in the eddies, wolves, fox, bear in the brushy ravines, mountain sheep and goats (Clements 1974). Beal noted the presence of lynx as well (Clements 1974). Ferris noted dead bison floating on the river, and the abundance of bighorn sheep. Beaver Dick Leigh noted waterfowl, badger, prairie chickens, trout, antelope, mule deer, elk, moose, black bear, grizzlies from the Tetons, sheep and goats in the 1870's (Thompson 1982). The valley was described as prairie like, with no trees except along mountain streams. The main moose winter range was on Trail Creek, to the southwest of the analysis area.

James Onderdonk (1885) states "with the advance of civilization animals have withdrawn further into the mountains. Buffalo have disappeared, grizzly and black bears have moved into the mountains, elk are rapidly disappearing, while antelope, mule deer and whitetailed deer are comparatively numerous."

William Ross Sandy, the first teacher in Teton Valley, states "game was plentiful in those days (1892). I could spend Saturdays in hunting and usually bring in two or three deer and occasionally an elk".

The following discussions are divided into vegetation communities and the wildlife they support.

Riparian Communities

Historically, disturbance created mosaics of successional communities. These disturbances included seasonally fluctuating water levels, beaver activity, grazing/browsing and periodic fire. This resulted in diverse vegetative structure and resulted in an abundance of wildlife niches for feeding, nesting, perching and cover. These areas provided relief from heat, as well as drinking water and provided succulent vegetation for most of the year. In addition, these areas were used as migration corridors by a variety of wildlife species. Because of high energy requirements, bears and other large predators would use riparian areas for food, cover and travel corridors.

Teton Valley riparian areas include fens, willow and cottonwood. Fens would have provided habitat for species such as whooping cranes. Willows are believed to have been extensive, providing food and building materials for beaver. Cottonwoods were likely to have been less dominant at that time, as distribution was limited to drainages. Currently cottonwood distribution in the Valley has expanded along irrigation ditches.

Historically, beaver were abundant in the Teton valley and assumed to be abundant in the adjacent mountain streams. Pierre's Hole was important due to the "large extent of excellent pasturage along the borders of its waters" (Ferris 1836); "beaver swarmed along the streams and in the swamps of Pierre's Hole" (Idaho Encyclopedia 1938). Wallace (19??) found that the area was the richest fur district that Hudson Bay trapped in the northwest. In 1824 they had 60 men employed as trappers. In the previous 4 years they had taken 80,000 beavers, weighing about 160,000 lbs. Other trapped species included marten, mink, otter and muskrat.
Beaver alter habitat by creating dams and ponds, providing habitat for a variety of plants and other animals. Beaver activity functioned to trap sediment, raise water tables and increase the width of the riparian vegetation community.

Drainages with evidence of historical beaver use include Main Fork of Packsaddle Creek, South Fork Packsaddle Creek and South Fork Horseshoe Creek, Main Fork of Horseshoe and Mahagony Creeks. Drainages that had no evidence of historical use by beaver include Henderson Creek and North Fork Packsaddle Creek.

Grass/shrub communities

Historically, the major processes that influenced vegetative distribution in these habitats were fire, precipitation, competition for moisture and herbivory. Herbivory functioned in nutrient cycling, seed dispersal, rejuvenation of plants and preparation of seedbeds. Herbivory was a result of grazing by bison, bighorn sheep, elk, mule deer, pocket gophers and invertebrates (esp. grasshoppers). These habitats have a fairly rapid decompostion rate and nutrient cycling process, compared to other habitats. This results in productive vegetative conditions.

Bison hunting become the principal means of subsistence for Native Americans after horses were introduced. In 1840, bison became extinct in southeastern Idaho (BLM Cultural Resource Inventory 1980). An 1841 map of the Oregon Territory by Charles Wilkes shows the area to the west of the Three Tetons as "buffalo country".

Bison grazing patterns may have also been interrelated to the abundance of antelope. Bison grazing can shift grassland vegetation to forbs, which are preferred by antelope. The antelope would put pressure on forbs, allowing grasses to recover and restoring habitat favorable to bison (BLM Cultural Resources Inventory 1980).

Bison inhabited the area but were largely gone by 1840's. These bison, generally found in small herds of 5 to 30 animals, were quite wary and followed altitudinal migrations. In summer, small meadows and parks in lodgepole pine forest were used. Major impacts of bison on their habitat included debarking of trees in concentrated areas, formation of trails and wallows and alteration of plant cover. Wet bottoms showed little effect, but upland winter range areas had the most impacts. These heavily grazed areas increased habitat for species that nest in areas with bare ground, such as killdeer and horned larks but decreased overhead cover, which would have increased vulnerability of small mammals to predation. Generally, after an area was heavily used, they moved to other areas and didn't return for several years (Meagher, 1973).

Bighorn sheep were noted as abundant prior to settlement. They were generally split into nursery bands of ewes, lambs and subadults and ram bands. These groups came together during the rut and spring greenup. Grasses, sedges and forbs were preferred foods, with shrubs being important in the fall and winter. Bighorn sheep are no longer present in the watershed.

Before settlement, elk were found in habitats ranging from plains, mountain river valleys to high elevations of the mountains. The main big game winter range was the Valley bottom where the animals found variety in its abundant grasslands, cottonwood forests and shrub fields.

Pocket gophers use grasslands, herblands and sagebrush steppe and have a major affect on soil, plant composition and plant succession. Populations fluctuate greatly, with one study in Yellowstone finding 102 per acre. Early explorers commented that the ground was so burrowed up that it was difficult to travel (Meagher 1998).

Lower-elevation forested communities

These communities offered a high degree of edge, readily available forage in the understory and a tree canopy, which modified the climate as well as provided nesting habitat. Snow tends not to crust or pile as deeply under the tree canopy, therefore, these areas provided important foraging areas for wintering ungulates. In addition, tree canopies offered shelter from the cold and heat. Snags tended to be long-lived and maintained at fairly constant levels. In areas where frequent, low intensity fires maintained open-canopied stands (Forest Plan EIS, III-11), the area probably had more use by large herbivores, grassland and open-canopy nesting birds and small mammals.

In areas where fire wasn't as frequent the stands had greater vertical structure. Species (marten, snowshoe hare, mountain chickadee, sharp-shinned hawk) using more closed stands were favored. Mature and old growth stands in this zone provided favorable conditions for primary and secondary cavity dependent species.

Higher-elevation forested communities

This interior forest buffered climate, maintained a constant source of snags and downed woody material and offered escape from predators. Large ungulates used these areas during summer months to relieve heat stress. Dead and downed materials were used as cover for small mammals, amphibians and ground nesting birds. These species are then in turn prey for larger predators like goshawks, boreal owls, lynx and marten.

The interior forest is broken by small meadows and grassy parks. These areas offer highly productive forage sources with the security of adjacent forest. Species such as elk used these areas as key habitat components during the summer and fall increasing species richness and density within the interior forest.

The most abundant guild of birds in the lodgepole pine forests is species that glean insects from tree foliage and bark. Major concentrations of beetles or other insects (often as a result of fire or disease) provided concentrated foraging areas for species such as black-backed and three-toed woodpeckers, which feed on bark and wood-boring beetles and their larvae.

One study in Colorado (Bennetts 1991) concluded that dwarf mistletoe has positive influences in both abundance and diversity of birds. Mistletoe brooms provided nesting substrate for birds and squirrels, resting habitat for some birds and food source for some (blue grouse, mule deer, chipmunks and porcupines). S. Patla (1997) found that 22 percent of her goshawk nests were "broom" nests.

Aspen communities

Historically, all age classes of aspen were represented across the area, in both riparian and upland situations. Species associated with aspen were canopy nesters, shrub nesting bird species and ground nesting species. Aspen overstories, downed logs and shrubby understories provided foraging, breeding and nesting habitat for many species. Some of the species associated with aspen are accipiters, buteos, falcons, owls, snowshoe hare, beavers, ruffed grouse, elk, deer, moose and bears (Debyle 1985).

WILDLIFE CURRENT CONDITIONS

Introduction

This analysis follows the "coarse-filter" approach to biodiversity evaluation. The underlying assumption is that if management of natural vegetative communities allows natural processes that are similar to those in which species evolved and adapted, a full complement of species can be sustained over time. In addition, the "fine-filter" approach will be incorporated. This involves individual species that may "fall through the cracks"; they may be rare, depend on uncommon habitats, or have significant conflicts with humans or current land management practices.

A previous analysis of wildlife habitat for the Big Holes (Johnson 197?) followed a different approach. They assumed that ecosystem stability may be correlated with species richness. They looked at birds and mammals in several major vegetative communities. Those communities with greatest species richness were assumed to be more stable. Information from their analysis has been incorporated.

Wildlife is dependent on vegetation and the corresponding habitat trends. Refer to the forested and non-forested vegetation discussions for habitat information and trends. Disturbance by humans is also important for wildlife. Refer to the recreation section for trends in roads, trails and general recreation.

Species Not Analyzed

Historically, the Big Holes provided habitat for **grizzly bears, wolves, and peregrine falcon**. There is no suitable or potential peregrine falcon nesting habitat in the analysis area (Johnson 197?). The last known grizzly bear verified in the Big Holes was 1970, when a yearling was killed near Stinking Spring. An unverified sighting of a sow with 2 cubs was reported in the same area in 1976 (Johnson 197?). These species are not occupying the area currently. Wolves are expected to disperse from the Yellowstone area and may eventually use the Big Holes. They are especially tied to ungulate populations; while wolves will not be discussed further, ungulates will.

Townsends Big-earred bats have not been documented on the Forest, but could be present. Surveys were done across the Forest in 1991 and 1995. In addition, surveys have been done on the south end of the watershed, for the BPA powerline project. Roosting, hibernating and maternity habitat is limited to caves and abandoned mines and is not likely to occur in the watershed. Abandoned coalmines have not been surveyed for use by bats. Any proposals to close adits or shafts would include bat surveys to assess and evaluate use that is occurring.

Other species not carried forward include the **northern bog lemming**. It is not likely that bog lemmings were found here; these fens are low elevation (in the valley) and the known current distribution is limited to extreme northern Idaho (USGS BRD and Nature Conservancy 1997).

Wolverine prefer high, remote, rugged mountain terrain. Undeveloped areas are especially important. Females are very sensitive to disturbance and will move den sites at the slightest disturbance. Heinemeyer and Copeland (1999) identified potential denning habitat across the Forest; none was identified in the Watershed. Wolverines, while known to use the Tetons, have not been reported in the Big Holes and it is unlikely that they are present as residents. Any use by wolverines is expected to be incidental.

Forest Plan Measures Not Analyzed

Elk habitat effectiveness (EHE) was addressed at the Forest Plan level. EHE is defined as the percent of available habitat that is usable by elk during the spring, summer and fall, outside the hunting season. The model incorporates open road and trail densities and hiding cover. The

existing elk habitat effectiveness is 0.49; after implementation of the Travel Plan, elk habitat effectiveness will increase to 0.56. The overall effect of this increase is a probable wider distribution of elk in areas that were underutilized because of prior higher motorized use.

Elk vulnerability (EV) is defined as a measure of elk susceptibility to being killed during the hunting season. The 3 parameters incorporated into this model are aspect variability, hunter-day measures and motorized road and trail densities. At the time of the Forest Plan, EV for Mahogany Creek Watershed was calculated to be at 60 percent bull elk mortality, which is not meeting State Fish and Game thresholds (Process Paper D, p. 71). Increased access has decreased hunter success (Ragotzke, pers. comm. 2000). After implementation of the travel plan, EV was calculated to be 30 percent bull mortality and meets state thresholds.

State Big Game Management Plans

The IDFG Elk Management Plan (1991-95) identifies management objectives for Game Unit 65 (the game unit located in Mahogany Creek Watershed): 1) maintain a post-season bull:cow ratio greater than 15:100 with 40 percent branch-antlered bulls; and 2) maintain yearling bulls less than 50 percent of the antlered segment of the harvest. The population in 1990 was increasing and the goal was to maintain the population.

The IDFG Deer Management Plan (1991-95) identifies management objectives for Game Unit 65: 1) maintain current population; 2) increase mature buck numbers; and 3) over a 3-year average, maintain at least 50 percent of the buck harvest in a 4-point category.

Predator Control

In 1908 predator control efforts to remove wolves, coyotes, lynx and cougars led to destruction of 522 coyotes, 19 bobcats, and 4 badgers in traps across the state (doesn't include those animals poisoned by strychnine and never found) (Idaho Wildlife, fall 1992). Harvest data for mountain lions in the Big Holes shows five lions taken in 1994 and 14 harvested in 1998.

Within the analysis area, the Red Mountain allotment is the only one with reported sheep losses from 1991-97. Records from 1998 and 99 show 18 percent and 24 percent of the losses were attributed to predators. Reports from ADC show the following control actions were taken on the Red Mountain allotment:

Table 3-10.

Year	Predators taken
1993	6 coyotes, 1 black bear
1994	1 coyote
1995	missing
1996	0
1997	2 coyotes
1998	1 red fox

Neotropical Migratory Land Birds

The status of neotropical migratory land birds (NMLB) was analyzed for the Interior Columbia River Basin. Among 132 species analyzed, 38 demonstrated significant population trends, including 14 with significant declines over a 26-year period. Based on the Atlas of Idaho Wildlife (USGS BRD and Nature Conservancy 1997), two of the 14 are not likely to be present in Teton County (loggerhead shrike and Brewers sparrow). They found that species with decreased population tend to be those that nest in the shrub layer, whereas species with increasing population trend to nest in tree canopies (Saab 1997).

Johnson and Keller (197?) found an estimated 156 nesting species of birds in the Big Holes. Bird surveys were done in the Big Holes from 1993 to 1996, comparing grazed and ungrazed habitats. While there was variation between years (observer abilities and climate differences), some conclusions were drawn. Focusing on the 12 species from the UCRB study, eight were found in the study plots. Song sparrows were common, chipping sparrows were more abundant on grazed transects and song sparrows were more abundant on ungrazed transects. Brown-headed cowbirds were abundant on grazed transects, but nest parasitism was not very prevalent. Only 3 nests surveyed experienced parasitism (Kiene 1996).

Table 3-11. NMLB with declining trends, and found in Big Holes study

Species	Nesting Habitat (Ehrlich 1988)
Killdeer	Nest on bare ground pastures, meadows with low sparse vegetation. Not expected to breed in W22, not analyzed further.
Mourning dove	Nest in open woodlands, agricultural areas with scattered trees.
Olive-sided flycatcher	Nest in open montane and boreal coniferous forest with abundant dead trees.
Willow flycatcher	Nests in thickets, especially willow.
Chipping sparrow	Nests in open coniferous forest
Song sparrow	Nests in dense vegetation along water.
Brewers blackbird	Nests in shrubby areas, riparian woodlands
American goldfinch	Nests in riparian woodlands

Small mammals

Analysis of mammals in the Big Holes (Johnson 19??) found a general tendency of species to utilize a wide range of habitats. Small mammals were sampled; deer mice and yellow pine chipmunks were the most widely distributed species, found in most habitats. Western jumping mice and red-backed voles were found in 1/3 of sampled habitats.

Riparian communities

Following settlement, **sandhill crane** numbers declined dramatically (Drewien 1974). Sandhill cranes nest in Teton Valley; active nesting has been observed near Horseshoe Creek, Packsaddle Creek, Dude Creek, Lizzard Lake and Mahogany Creek, in the lower slopes below

theanalysis area. Teton Valley is a major fall staging area; major areas are to the west of the Teton River, between Horseshoe and Patterson Creeks (Drewien 1994).

Whooping cranes, which were probably never numerous, also declined. Their wary nature made them particularly vulnerable to human disturbance. Whooping cranes raised by the Grays Lake cross-fostering program are found in the GYE from April to October, Teton valley being preferred as summer range and a fall staging area. Two or three have been observed in Teton Valley.

Trumpeter swans used to be present over southern Canada and northern United States. Populations declined due to an over exploitive, swan skin trade, habitat destruction and over hunting. More recently, the Rocky Mountain population of trumpeter swans has grown, due to habitat protection, reduction of illegal hunting and artificial feeding. Key winter habitats used in the Teton Valley are pieces of the Teton River from Horseshoe Creek to Trail Creek. (Maj 1994).

Bald eagles winter in Teton Valley, from early October to April. In the fall, they may be seen along the lower foothills and later in the winter along the river. They have been observed in areas adjacent to Mahogany Creek watershed including lower Horseshoe, Mahogany and Henderson Creeks.

Beaver management has shifted throughout the years. By 1899, Idaho put beaver on a protected list, due to very low numbers. By 1927 there was a statute permitting the taking of beaver by special permit where damage was occurring to private property. Starting in 1938, a livetrapping program was pushed to restock barren areas. By 1941, caretaker trappers were assigned allotment areas to manage (Idaho Wildlife fall 1992).

A Beaver Management Plan for the Horseshoe Creek drainage (1964) states that there was an overpopulation of beaver prior to 1960 and at carrying capacity since then. All of the suitable beaver habitat found in their surveys was in stream sections with gradients less than 4 percent, year round water, a canyon bottom at least 50 feet wide and with willows or aspen within 100 yards of water. Primary foods were aspen and willows, but chokecherry and serviceberry also used. Surveys found three colonies in lower North Fork and Main Creek, one colony in Upper North Fork, two colonies in Superior Creek and one colony in Bell Creek.

The 1967 Multiple Use Plan for the District notes that beaver were numerous and specifically mentions Horseshoe and Packsaddle Creek. Historically used areas identified as potential for beaver relocation are Dude, North Fork Horseshoe, Packsaddle and Milk Creeks (Decision Memo 1995). In May 1995 one beaver was re-located to mid-Dude Creek.

Information regarding beaver populations in each stream reach is found in the Hydrology Section.

One indicator species for riparian habitats is **spotted frogs**. Henderson and Mahogany Creeks were surveyed in the summer of 1992 (Clark 1993). Horseshoe and Packsaddle Creeks and Packsaddle Lake were surveyed in 1995 and Alligator Lake in 1994. The south end of the

analysis area was surveyed for the BPA powerline project (Maj 1998). No spotted frogs were found on those surveys. Spotted frogs have been found in Moose Creek to the east of the analysis area. Other amphibians have been observed; Lizard Lake has tiger salamanders and boreal chorus frogs. Other areas may still provide habitat for spotted frogs; especially drainages with beaver ponds and no fish.

Factors affecting suitability for spotted frog and amphibian habitat include decrease in ponded habitats, introduction of fish which prey on eggs and tadpoles, irrigation on lower reaches that dewater segments and create barriers and livestock grazing. Livestock grazing can affect amphibian habitat by decreasing vegetation structural diversity, decreasing the invertebrate prey base, decreasing thermal cover (affecting water temperature and egg/tadpole survival) and decreasing protection from predators (Belsky 1999).

Livestock grazing can also alter riparian habitat for birds. Vegetation components most important to wildlife are tree species and densities, foliage height diversity, foliage volume, patchiness and shrub species and densities (Ohmart 1996). A decrease in vegetation structure reduces foraging and nesting habitat, as well as decreasing perches and roosts and protective cover from predators (Belsky 1999). Of the previously mentioned neotrops (NMLB), three are shrub-nesting and may be affected by these habitat changes (willow flycatcher, song sparrow and Brewers blackbird).

Generally, most riparian habitats are in an improving condition. An exception to this is the Westside Allotment (Dry Henderson, Henderson, Patterson and Grove Creeks), where grazing utilization is very light on the uplands (estimated 20 percent) and heavy in the riparian corridor (estimated 70 percent) (Stimpson pers. comm. 2000). Nesting habitat and success on these streams is expected to be lower.

Grass/forb/shrub communities

A variety of small mammals, invertebrates and birds are found in these habitats. Species associated with sagebrush have adapted to utilizing sage leaves as forage, and the brushy lifeform as thermal cover, nesting sites and perches. Small mammal communities provide a prey base for raptors and small carnivores. Species like shrews prey on insects found in these habitats. Uinta ground squirrels are important prey for goshawks in the watershed (Patla 1997). The role of voles and other rodents in dispersing seeds is important to the function of this ecosystem. Rodents, especially deer mice, cache bitterbrush seeds assissting in its regeneration.

Burrowing animals such as ground squirrels and pocket gophers mix and loosen soils and also transport nutrients from plants and soils and alter plant species composition. Other animals such as deer mice, voles and weasels use abandoned burrows. These species find suitable habitat in open areas with well-drained soils but existing soils information is not detailed enough to map specific soil depths. Pocket gophers were listed as abundant in lower Henderson Creek (Henderson AMP 1992).

Process Paper D of the Forest Plan, identifies 57 out of 85 mammal species partly associated with shrublands and grasslands. In addition, 45 species are associated with juniper/mountain brush. Of the 300 species of birds potentially occurring on the Forest, 121 species are associated with shrublands/grasslands, and 134 species are associated with juniper/mountain brush. Finally, 13 species of amphibians and reptiles are associated with sagebrush/grasslands and 12 species are associated with juniper/mountain brush.

The "prairie chickens" reported in the valley in historical accounts probably refer to sage grouse and sharp-tailed grouse. Sage grouse were historically present on the east side of the valley (Darby Creek). Sharp-tailed grouse numbers in the valley have been increasing, maybe due to lands in the CRP program. These species are not expected to be present on public lands in the watershed.

Big game winter range

According to the 1967 Multiple Use Plan, **mule deer** had not returned to the valley until the 1930's. Since that time, numbers increased and equaled or exceeded the capacity of the winter range. At that time, big game winter range was described as limited; browse was in poor condition due to heavy deer and livestock use.

Today, elk are largely excluded from the valley by agricultural development, urban development and subdivisions. In addition, winter snowmobiling tends to exclude elk from the valley. As a result, grass/shrublands in the analysis area are increasingly important for **elk winter range**.

The most important winter range for deer and elk on the west side of the valley runs from Mahogany Creek to Horseshoe and up to Grandview Point. Part of the winter range in the area has been given a winter range management prescription in the Forest Plan (Horseshoe/Packsaddle). The majority of the animals are located south of Dude Creek to Horseshoe Creek on south-facing shrub and grass/forb habitat. Utilization of bitterbrush, an important winter browse species, by deer and elk has been estimated at 57% to 60% over three winters. Most of the wildlife depredations problems in the valley occur in grain fields adjacent to this area (Wildlife Winter Range and Winter Recreation Management EA 1992).

Other winter range areas are found from Mahogany Canyon south to Pine Creek Pass. These areas are composed of scattered mountain mahogany and south-facing shrub fields. Part of this is on public lands (North and South Mahogany Creek), but most is on private lands in lower Mahogany, Twin Creek to Drake Creek and the south side of the valley. Home development limits availability of these winter ranges.

A 1990 flight by IDFG found 401 deer, 30 elk and 11 moose in Game Unit 65 (J. Naderman, 6/4/90 letter). A more recent report (1997-98) estimated elk numbers on the winter range to be around 995 +/- 62. Other comments on the herd is that it has more or less been stable, bull:cow ratios are acceptable but there have been occasional problems with elk getting into haystacks (K. Ragotzkie, IDFG). In the west half of Game Unit 65, the elk population is increasing, the goal is to stabilize cows and bulls. This herd is considered to be at or above population

objectives for this area. In this same area, there are 400 deer, with an increasing population, and the goal is to maintain numbers and increase mature bucks (K. Ragotzkie 12/3/97).

Winter range vegetation. An analysis of Big Hole winter range by Johnson and Keller (197?) found three basic types of vegetation. The sagebrush/grass and mountain brush communities were showing a trend of moving from shrub to grass/forb communities. Mountain mahogany types showed evidence of past heavy browsing and was unavailable to deer. The last type was Douglas-fir/Pachistima, which received heavy browsing use.

A 1980-81 IDFG report states that "heavy deer use, reduction of grazing and changing to rest-rotation systems are converting browse winter ranges to grass winter ranges. This favors an increase in elk, but provides little forage in deep snow winters. This herd should probably be reduced".

In 1993 the Packsaddle Sheep and Goat Allotment was converted to cattle and horses. Elk, deer and moose winter range was a major issue identified as driving this decision. The trend had been for an increase in grasses and decrease in shrubs such as bitterbrush. This was believed to be a result of 1) grasses and forbs out competing bitterbrush seed for early spring moisture, thus no regeneration, and 2) sheep readily graze bitterbrush at any stage of growth. It was felt that the change in livestock was needed to stop the shift from shrub winter range to grass winter range (Packsaddle EA, 1993). There has been no monitoring to evaluate the results of change of livestock types.

Mountain mahogany is a favored browse species, especially for mule deer. Mountain mahogany in Mahogany and Dry Henderson Creeks shows evidence of past heavy browsing but not much recent use and very few young plants. Bitterbrush, which is also a preferred browse species, was found in Dry Henderson. It is about 18" tall and unavailable in the winter.

Several prescribed burning projects have been implemented in the past to improve winter range conditions. More recently (5/98), a decision was made to treat winter range with prescribed burning or mechanical treatments. The goals and objectives of the plan were to provide quality elk and mule deer winter range, manage vegetation to improve cover or forage conditions needed for wintering deer and elk and use prescribed fire to maintain or improve winter habitat and enhance ecological conditions. See the fire occurence section for more information.

Winter range and recreational use. Generally, elk have a strategy for the winter emphasizing energy conservation. Winter recreational use increases displacement and increases energy consumption. This results in the need for increased foraging at a time when forage is limited in quantity and quality. One of the main problems associated with the winter range at this time is thought to be widespread snowmobiling, cross-country skiing and spring antler hunting on winter ranges, (Rogotzki pers. comm. 2000). In March 2000, 300+ mule deer were temporarily displaced by two horseback riders in the Horseshoe/Packsaddle winter range (K. Kluegel pers. comm. 2000).

Winter range and subdivision. Housing developments have occurred from the valley bottom to the foothills adjacent to the public lands. In general there are fewer houses on the north end

of the analysis area (mostly in Packsaddle Subdivision) and more subdivisions adjacent to the forest on the south end. Subdivisions can affect big game through a direct loss of habitat due to vegetation alteration and as barriers to movement as a result of human disturbances and associated pets.

A large subdivision is being proposed in the Pole Canyon area, along with a golf course and fishing ponds (Teton Springs development). Potential wildlife issues identified include; alteration of riparian and introduction of exotic fish and effects on amphibians; loss of grassland foraging habitat used by forest raptors nesting on forest margin; potential conflicts with wildlife (beaver and moose use of planted trees and shrubs etc); pet's effects on ground-nesting birds and wintering big game; and indirect effects of increased recreational use on the Forest.

Winter range and disease. The IDFG recently released their Winter Range Plan (December 1999). The primary objective of the winter range program is to implement management to remove elk dependence on supplemental winter feed. This will lessen the threat of disease transmission within congregations of elk on feed grounds. This includes 1) insuring adequate areas of high quality winter forage, 2) insure habitat is secure from human disturbance, 3) elk populations are within carrying capacity of available winter habitat and 4) public involvement and education. Game farms are also another source of disease. There is one game farm adjacent to the analysis area, Bagleys, at the mouth of Grove Creek.

Elk calving

Calving generally occurs from mid May to mid June. Some areas may be used traditionally for calving, but these will vary depending on weather and snowmelt conditions. Some factors which affect use of calving areas include distance from disturbance, gentle terrain, proximity to water, succulent vegetation, and good visibility. After calving, they will join the herd in nursery areas. The Dry Hollow to Dude Creek area has been identified as calving habitat. This area is within the winter range closure, but opens up to hiker, horseback use on April 15. It is not known what effect antler hunting has on elk habitat use during calving season, but it can be expected to cause temporary or longer term displacement, depending on intensity of recreational use.

In addition, the area on the south end of the valley was identified as excellent calving habitat (Wildlife Winter Range and Winter Recreation Management EA 1992). This includes areas around Allen, Smith, Pole and Murphy Creeks.

Forested communities

Old growth and old growth recruitment was evaluated for the timber stands that had stand data (see forested vegetation section). For the rest of this discussion, old growth and old growth recruitment stands are figured into the mature forest category, except where specifically mentioned.

Fungal wood decays are very important as wildlife habitat components. In general, decayed wood offers substrate that provides critical niches for feeding, and structure that provides habitat for nesting, denning, resting, hunting, courtship and communication, such as drumming by some woodpeckers (Parks 1998).

Mistletoe is present across the watershed in lodgepole pine and Douglas fir. Many species of wildlife use dwarf mistletoe plants and seeds directly for food and use the structure provided by mistletoe brooms for resting and nesting sites (Parks 1998).

Goshawks use open, mature or old growth forested stands. Nests are usually in stands with dense canopies (multi or single layered) and low ground cover, on moderate slopes, often within a few hundred meters of water on northerly aspects. Most nests are in conifer or conifer/aspen, usually against the trunk or in a crotch near the bottom live canopy layer (HCA/CS 1995). There are usually alternate nests within the nest stand. Suppression of wildfire can result in structural changes that lead to reductions in goshawk numbers and foraging opportunities (HCA/CS 1995).

Patla's (1997) study of the northern goshawk on the Targhee found territories in mature forests, where mature forest cover averaged more than 60 percent in the nesting, post-fledging and foraging areas. The majority of nests were associated with mature Douglas-fir forests on north aspects, although nests have been found in aspen, mixed conifer and lodgepole stands (Patla 1991). Goshawks rarely reused the nest, but great gray owls often did.

Goshawks are opportunistic foragers, preying upon a variety of different birds and mammals. On the Targhee, over 72 percent of prey biomass consisted of four species: snowshoe hare, Uinta ground squirrel, ruffed grouse and blue grouse (Patla 1997).

Patla found a positive relationship between the amount of sagebrush/shrub cover and goshawk productivity and territory occupancy. This finding implies the importance of sagebrush/shrub communities as foraging habitat (Maj 1998). The onset of nesting in 1993 and 1994 corresponded with the emergence of local Uinta ground squirrels from hibernation. Productivity was also associated with spring precipitation and temperatures.

There have been extenisve goshawk surveys north of Horseshoe Creek. There are four mapped, identified nesting territories within the analysis area and one immediately adjacent to the Forest Boundary. Goshawk surveys were also done on the south end of the analysis area for the BPA powerline project (Maj 1998). While no goshawks were documented here, the habitat appeared very suitable.

The distribution of **three-toed woodpeckers** overlaps that of spruce. They select for single-storied mature or overmature forested stands where beetle outbreaks are occurring. They scale bark for bark beetle larvae on tree trunks and on downed logs and generally forage on trees 20-50 cm dbh and nest in trees 30cm dbh (Cherry 1997). Surveys on the south end of the analysis area for the BPA powerline project did not document this species (Maj 1998). However, they have been observed in several areas of the watershed and are expected to be present across the area in suitable habitat.

Another woodpecker, the black-backed, is strongly associated with fire-killed stands and beetle concentrations found after fires. As the result of few large fires, foraging habitat for black-backed woodpeckers is very patchy and may be found in smaller fire patches and scattered insect outbreaks.

Small mammals fill many ecological roles in forested ecosystems; seed predation and caching/dispersal, altering stand composition by feeding on seedlings, insect predation, fungal spore dispersal and as a prey base for predators (Pearson 1999). Snowshoe hare are very important to lynx. Red squirrels are prey for lynx, fisher and goshawk. Red-backed voles are very important to boreal owls (Hayward 1994), while pocket gophers and microtus are very important to great gray owls.

Lower elevation forested communities

One indicator species for this forest type is the **flammulated owl**. Surveys have been done for this species in the Horseshoe-Packsaddle area, but none have been found. Surveys have also been done on the south end for the BPA powerline project (Maj 1998). None were documented there. They have been found on South Fork Snake River corridor and on a Douglas-fir/aspen draw northeast of Mike Harris flat (to immediate east of watershed).

Higher elevation forested communities

The **boreal owl** is associated with this higher elevation, mature forest. Surveys have found this species to be present in the watershed (Horseshoe 1991, Packsaddle 1994, Relay Ridge 1989). Boreal owls feed on numerous species of small mammals, but their diet is dominated by red-backed voles, flying squirrels, deer mice, shrews and pocket gophers (Hayward 1994).

Great gray owls often use nests of accipiters and corvids and also use tree/pathogen/insect interactions (dwarf mistletoe) that cause deformed tree branching (Hayward 1994). Great gray owls commonly use alternate goshawk nests. Patla (1997) found great gray owls nesting in active goshawk territories on 13 different occasions, in eight different territories. They forage in forest openings on small mammals; rodents (voles) dominate their diet over most of their range. An Idaho study found pocket gophers to be important, followed by microtus. Surveys in Rammel Hollow (1991), Packsaddle (1984, 1991 1994), Milk Creek (1991) and Dry Hollow (1993) have found this species to be present.

Fisher prefer mesic forest types such as moist Douglas-fir and mixed conifer. Lowland, nonforested habitat greater than 5 km are barriers to dispersal. The area is part of the Yellowstone population, with the Tetons as a landscape linkage zone. They prefer late seral forests with canopy closures of more than 70 percent, but a diversity of age classes are more productive over time (Forest Carnivore HCA/CS 1995).

Riparian corridors are especially important habitat, serving as travel corridors and providing rich habitats for fisher prey (Witmer 1998). Recommended conservation measures are 1) conservation of late successional forests at low to mid-elevations, 2) maintenance of links

between populations, 3) maintenance of riparian corridors for use by individuals and populations and 4) regulate trapping pressure and human disturbance. There was a fisher sighting in Drake Creek in 1990. Furbearer surveys were conducted for the BPA powerline project, across the south end of the watershed. There was an unconfirmed fisher reported (Maj 1998).

Lynx have been documented to occur in the Big Holes, and in the watershed. One lynx was trapped in Patterson Creek (1961) and two sets of tracks were seen in Patterson Creek in 1991. During the winter of 1998, there was a lynx sighting along the highway near North Pine Creek. A lynx was sighted in summer 2000 along South Fork Packsaddle Creek near the Forest boundary.

Past management of lynx has varied thru the years. Historically, predator control actions also included lynx. Lynx were included in the 1973 Predatory Animal Control Plan. In 1977 the lynx was reclassified as a furbearer. In 1990 the lynx trapping, hunting and pursuit seasons were closed. Before that time, there were about five lynx taken per year in the state.

The watershed is considered to provide lynx habitat. The Lynx Conservation Assessment and Strategy (LCAS) (January 2000) identifies several habitat components (discussed below) to be assessed at the planning (or watershed) level. The whole watershed was identified as one lynx analysis unit (roughly 43,000 acres or 67 sqare miles).

Lynx denning habitat in the watershed is provided by mature lodgepole and mixed conifer stands over 300 feet from roads. These forest types were selected because of the large amount of downed woody debris present. It is assumed that downed woody material within 300 feet of a road has been harvested by firewood cutters. Based on this assumption, 50 percent of the watershed provides denning habitat.

Lynx foraging habitat includes snowshoe hare, red squirrel and alternate prey habitat. Snowshoe hare habitat is keyed on conifer seedlings and saplings or brush species in the conifer understory. We found that 55 percent of the watershed provides summer habitat for snowshoe hare. Winter snowshoe hare habitat is more limited, due to snow depths. Snow will cover smaller understory trees and shrubs, reducing available browse and cover. Suitable areas may be limited to younger aspen stands (165 acres) and small understory patches within the mature conifer types. Red squirrel habitat is based on cone production and is most abundant in all mature conifer stands. About 50 percent of the watershed provides red squirrel habitat. Alternate prey species habitat is found in the non-forest types, which are found over 25 percent of the watershed.

Movement corridors are found primarily along riparian corridors and major ridge systems. The ridge system along the west watershed boundary is the major ridge system. This is about 5 percent undeveloped, 35 percent roaded and 60 percent accessed by motorized trails. Other minor ridge systems to the east are displayed on map XX and have varying degrees of road and trail development. Drainages also vary in amount of access. Milk Creek and North Fork of Packsaddle are generally undeveloped. Most of the other main drainages have roads and motorized trails within them.

Unsuitable habitat (areas which aren't denning or foraging habitat) is limited to only four percent of the watershed in summer.

The LCAS identified **backcountry roads and trails** as risk factors to lynx. Listed Conservation Measures provide a guideline that calls for open road densities of less than two miles per square mile in lynx habitat. The prescription areas within the watershed fall below this threshold. See the roads discussion for road densities.

Snow compaction is another risk factor identified for lynx. Compacted trails allow access of other predators, such as coyotes and bobcats. These competitors are usually excluded form lynx habitat due to deep snows. Bobcats usually use lower elevations in winter but these differences disappear in the spring and fall. Coyotes show the greatest potential for competition during low snow periods or when use of hard packed snow and bare ridges allows access to higher elevations.

Groomed snowmobile trails are found on the north end of the watershed. A large "play area" is found in Packsaddle Basin, along the major ridge system. Winter use on the south end is more individual use by snowmobilers, skiers and snowshoers.

While it appears that lynx are tolerant of **human disturbance**, an exception to this may be activities around a **den site**. Of the identified potential denning areas, part lies in the mapped security areas (areas over ½ mile from an open motorized road or trail). The Relay Ridge, Dude Creek and Mount Manning/South Twin security areas are about 50 percent denning habitat. The head of Mahogany provides about 75 percent denning habitat.

Highways have also been identified as a risk factor for lynx. Highway 31, over Pine Creek Pass, bisects lynx habitat and may increase the risk for mortality, although none have been documented at this time.

Overall, the lynx analysis unit baseline existing condition is probably moderate. Summer habitat quality is probably high, due to the high amount of denning and foraging habitat and low amount of unsuitable habitat. There are no areas of large permanent habitat loss (such as resorts or other large developments). Winter habitat is more limited, due to limited snowshoe hare habitat and due to groomed and off-route winter recreational use.

Aspen communties

Currently, most of the aspen is in older-aged stands, with interspersed conifers and grassy understories. As a result, habitat for species like ruffed grouse, moose and showshoe hare is declining. Habitat for species like red-naped sapsuckers (forage on mature trees) is at optimum right now, but will decline over the long term as aspen regeneration is lacking. Presence of cankers on aspen are used by insects such as poplar borer, cicada and treehoppers, which are in turn prey for woodpeckers (Ostry 1998).

SOCIAL REFERENCE CONDITION

This section documents various aspects of human habitation within and surrounding the watershed. The timeframe for reference condition is prior to European settlement of Teton Valley. This was a time when natural resource use was sporadic.

Native Americans

The first inhabitants of the area were Native Americans approximately 10,000 years ago during the Paleo Indian Stage. They used this area primarily for hunting elephants, extinct bison and pronghorn antelope. (McDonald 1983)

Later in time, Crows, Shoshone and Bannock tribes inhabited the area (Driggs 1970) using this area primarily to hunt. The use of the watershed seemed to be mainly in passing rather than a focus for hunting and gathering. There were no winter camps in the watershed or on the Targhee National Forest. (McDonald 1983) The species hunted were grizzly bear, black bear, moose, mountain sheep, mountain goat, elk, whitetail deer and mule deer. These species were hunted by individuals or small groups because of the animals predictable behavior (established salt licks and trails) and their small home ranges. Mountain sheep and deer were ranked highest for subsistence resources because they had a high caloric yield and low processing costs. Bison were not hunted in this area until the introduction of the horse around the mid 1700's. Horses increased the distance the tribes traveled and increased bison hunting opportunities. By 1840, bison were extinct in eastern Idaho and the tribes traveled as far as Montana to hunt bison (Liljeblad 1957).

Lithic scatters found in the upper elevations of Mahogany Creek Watershed provide evidence of the tribes passing. These are found on ridges and near water sources such as Packsaddle Springs. The Big Hole Mountains contain a grey obsidian which is very unusual for eastern Idaho (EA for Grandview II Timber Sale 1981). The people followed the herds of animals from their winter range to their summer range and when the high elevation plant productivity declined they would head back down to the winter range. The tribes were in this area during the movement from winter to summer range.

Some dendrochronological studies indicate Native Americans set forest fires to improve forage for big game and their horses (BLM 1980). Native Americans set low intensity frequent fires to enrich grazing, encourage vegetation for browse for large mammals and berries for human and animal consumption; signal other tribes or send warnings; and conduct ceremonies. The widespread use of fire by Native Americans over long periods of time shaped the mosaic of vegetation and the associated animal communities (USDA Forest Service 1997).

Trappers

Fur trappers frequented the area because of the abundant beaver. The first trapper was John Colter in 1808 (Driggs 1970). In 1929 and 1932, rendezvous were held in Teton Valley attracting many fur trappers and traders. The fur trade lasted for about 50 years in Idaho with the height of trapping in the 1830's. By 1840, most of the fur companies had disbanded and

only independent trappers were still in business. (Clements) The trapper's use was seasonal and focused. They relied on the natural resources in the area for food, clothing and shelter.

SOCIAL CURRENT CONDITION

The timeframe for current condition begins about 1880 when the first European settlers came to Teton Valley. Unlike the Native Americans and trappers, European settlers remained in one place, consistently utilizing natural resources.

European Americans

The first permanent settlers moved to Teton Valley in 1882. They relied on the natural resources for their livelihood. The settlers used wood products for homes, corrals, construction materials and firewood. They hunted wildlife for food and picked berries (huckleberries, serviceberries, choke cherries, haws) for preserves. The first irrigation canals were constructed in 1889 to move water out of the swamps. In 1887, the mouth of Horseshoe was settled followed by the mouth of Mahogany and Packsaddle in 1889. (Driggs 1970)

Populations declined after the 1920's until the 1990's when an influx of "newcomers" moved to the Valley. Following are populations for Teton County, Idaho taken from a 1967 Ranger District Multiple Use Plan for Teton Basin Ranger District and the DEIS for Squirrel Meadows Grand Targhee Land Exchange (1999).

1920 – 3,900	1963 – 2,623
1930 – 3,570	1970 – 2,359
1940 – 3,600	1980 – 2,929
1950 – 3,200	1990 – 3,457
1960 – 2,640	1998 – 5,673

Populations within the area are expected to continue to increase over the next 50 years. The population will become older, more affluent, more educated and racially and culturally diverse (USDA Forest Service 1997). The increase in population suggests that demands on public resources will continue to increase especially recreation, Christmas tree harvest, firewood gathering, mushroom and berry picking (USDA Forest Service 1997).

Main Industries

The first settlers were farmers from Utah, southern Idaho and the Midwest (Holmes 1989). Crops that have been farmed during the history of Teton Valley are peas, lettuce, cauliflower, cabbage, seed potatoes, strawberries, raspberries, timothy, clover, oats, barley and winter wheat (Driggs, 1970). Cattle were first raised in the area followed by sheep.

Coal was mined in several locations in Horseshoe Canyon from 1882 to 1946, employing locals in the early years and supplying the Valley with affordable coal. In 1918, the railroad spur was completed to the mines. By 1926 the town of Sam, which serviced the mines located in Horseshoe Canyon, was a thriving community of over 200 miners along with their families. By 1933 when the railroad pulled out of Sam, the community had all but disappeared. (Elliot).

In 1912, the railroad came into Teton Valley, providing more jobs with its construction and boosting the economy. This enabled goods to be easily shipped in and out of the Valley. There is no evidence of "tiehacking" in the Watershed.

In 1925 and 1979, oil was drilled for near the mouth of Horseshoe Canyon (Driggs 1970) and in Twin Creeks between 1932 and 1939 (Fire Plan for Districts 5 and 6 1932-1939).

Logging has always played a part in the area's economy with a major role in the 1970's and 1980's during the mountain pine beetle salvage operation. Today, there are a few small mills and logging operations in the Valley that obtain their timber from all over Idaho, Wyoming, Montana, Utah and Nevada. Households and ranches still depend on the Forest for firewood, post and poles. Residents adjacent to the watershed like to gather these products within the analysis area.

Today, Teton County, Idaho has a mixed economy with agriculture playing a major role along with tourism related employment (Targhee National Forest 1999). The 1997 FEIS for the Revised Forest Plan (page III-84) stated the highest number of jobs in Teton County, Idaho in 1994 was in the agriculture industry (496 jobs), followed by government employment (372 jobs) and service and retail trades (355 and 349 jobs respectfully). The economy is expected to evolve toward more informational based technologies and service and away from agriculture and forestry (USDA Forest Service 1997).

The National Forest

The Forest Reserve Act was passed in 1891 because citizens were concerned over possible exhaustion of timber supplies and the excessive grazing. The Yellowstone Reserve was created in 1903 by consolidating Teton, Yellowstone and Absoroka Reserves (Alexander 1987). The Forest Service was established in 1905 to conserve water as well as to manage a growing federal reserve program. The management was to ensure a sustained yield of timber to contribute to national growth and the stability of local economies (USDA Forest Service 1997).

In 1908, the Targhee National Forest was created by merging Henry's Lake and Yellowstone Reserves. In 1917, Palisades National Forest, where the watershed resided, was added to the Targhee National Forest. (McDonald 1983)

Major land management themes have changed from privatization (1800-1891) to commodity production (1945-1960) to increasingly complex and contentious demands such as balancing ecosystem health and fire management (1960 to present) (USDA Forest Service 1997). These themes were accompanied by a series of Acts to provide management guidance. The Taylor Grazing Act of 1934 brought range regulation, removing the land from potential sale and placing it under the jurisdiction of the Grazing Service which became the BLM in 1946 (USDA Forest Service 1997). Multiple Sustained Yield Act of 1960 defined multiple use as management of all the various renewable surface resources of the National Forests so that they are utilized in the combination that will best met the needs of the American people without impairment of the productivity of the land, with consideration being given to the relative values of the various resources and not necessarily the combination of used that will give the greatest dollar return or the greatest unit output. This act institutionalized uncertainty and ambiguity

and marked the beginning of the modern period of conflict over what constitutes proper stewardship of the public lands. The 1970's was the decade of regulating public lands. The Forest and Rangeland renewable Resources Planning Act, The Federal Land Policy and Management Act and National Forest Management Act were passed. The 1980's and 90's were characterized by controversy and public concern about ecosystem health and its physical, biological, economic and social meanings. (USDA Forest Service 1997) The beginning of the Sagebrush Rebellion was in the late 1970's early 1980's protesting the over-regulation by the federal government (Alexander 1987). The County Right's movement believes that federal administration of public lands is illegal (USDA Forest Service 1997).

Currently the most highly valued uses on Federal land are timber, fishing and hunting. By 2045, they will be motor viewing, day use and trail use (USDA Forest Service 1997)

Several Ranger Stations were located in the analysis area. Grandview Ranger Station in 1915 was approved as a permanent headquarters for Rangers as it had facilities to provide comfort for a family. Hay and winter wheat could be raised successfully at the Ranger Station. The other Ranger Stations located at the Forest boundary on Mahogany Creek, Henderson Creek, Milk Creek, Twin Creek and Elk Flat were only used in the summer as they were not equipped to house a family and had poor access in the winter. (USDA Forest Service 1916)

Land Ownership

The ownership of the land within Mahogany Creek Watershed is divided between National Forest (40,843 acres), private land within the Forest boundary (1,824) and Bureau of Land Management (300 acres), which is located in scattered parcels outside of the Forest boundary. See Map X for details.

The bulk of the private land is owned by M. Maytag (1080 acres) who purchased it in 1970. In 1999, she sold 114 acres on the south end of her property where a new road and house are being built. This land is surrounded entirely by National Forest. The other 744 acres of private land are smaller parcels located at the mouth of Horseshoe Canyon, Pole Canyon area and160 acres in the northeast corner of the watershed that was traded by the Forest Service to a private individual in 1993. These smaller parcels are bounded by National Forest on three sides and private land on one side.

Land ownership adjacent to the Forest boundary is a mix of agriculture and subdivisions. Prior to 1990, most of the land adjacent to the Forest boundary was used for agriculture purposes. Since 1990, the numbers of houses and subdivisions adjacent to the Forest boundary have increased with increasing value and demand for forested land. Most of the adjacent land from Mahogany Creek north to Grandview Point is agriculture land with the exception of Packsaddle estates subdivision located at the mouth of Packsaddle Creek. Most of the adjacent land south of Mahogany Creek to Pine Creek Pass highway is subdivisions with agricultural land dispersed throughout. The land adjacent to the Snake River Range on the south end of Teton Valley is currently agriculture except for Aspen subdivision adjacent to Murphy Creek. A golf course/development adjacent to the Forest between Sherman Springs road west to Pole Canyon has been proposed and will be built over the next six years with a total of 540 residences.

Increased residential development adjacent to public lands will increase pressures to control fires and to modify some forest practice. The types of people attracted to the area may be more interested in ecological issues and passive use values rather than traditional extractive industries. (USDA Forest Service 1997)

Sense of Place

A Sense of place is how people relate to and express an experiential understanding of geographic areas. People's perception of place give that area special meaning to them, their community and their culture. Place is usually passed down for generations. (USDA Forest Service 1997)

Recreation visitors develop attachments to places based on their past experiences which are the meanings often passed from one generation to the next. People who earn a living from public land resources and opportunities typically develop close relationships to places on the land.

Speaking with several valley residents, it appears that Mahogany Creek Watershed is a very special place to them. People have been using the resources in the area for grazing, logging, firewood, post, poles, huckleberries, hiking, horseback riding and camping since the first settlers came to Teton Valley.

- "The watershed is a wonderful area with abundant wildlife and gentle slopes."
- "I enjoy the diverse, productive habitats and the vegetative settings."
- "The serenity that I encountered in the Big Holes comes form escaping that which is predictable, regulated and quantified."
- "The west side of the Valley is a living laboratory, showcasing not only forest succession and species expansion, but also changing aspects of human behavior."

The local public is divided in what they want natural resources available for. Some want extractive uses to continue uncontrolled and unlimited access. Others value the opposite. Public concern for environmental quality has reached an all time high. People want to see natural resources available for future generations. The public strongly supports a less commodity based more ecologically sensitive approach to Federal forest management. (USDA Forest Service 1997)

A national survey commissioned by the Forest Service found that respondents wanted to maintain healthy forests, create recreational opportunities on public lands and that they valued not compromising the long term health of public lands for short term gain. People believe that the Federal Government should assist state and local governments in managing forestlands by discovering and disseminating information needed to solve resource problems and "those who live in closest proximity should play the primary role in the way public forests are utilized and managed". (USDA Forest Service 1997)

Logging on federal land is the most controversial. Local communities support logging while the general public are more divided on the subject. (USDA Forest Service 1997)

The general public is evenly divided on construction of new roads and most people support road closures. Strong support exists for endangered species laws, but the public is concerned

with the costs of those programs. (USDA Forest Service 1997) Many locals don not support road closures and don not want laws to interfere with forest uses.

The intense interest of Indian peoples in the ecosystems and natural resources is founded in their long-term relationship and spiritual attachment to the land. There is a strong sense of place that is passed between generations through oral storytelling, rituals and personal experiences. The natural world still pervades Indian life. Their dependence on natural resources is expected to draw agencies into dialogue with tribes well into the future. (USDA Forest Service 1997) This area is still significant to the Shoshone–Bannock tribes for spiritual sites and gathering of forest products.

RECREATION REFERENCE CONDITION

The time frame for reference condition is prior to 1945. Previous to 1945 life was hard and very demanding with little time to recreate. Many of the subsistence activities that occurred were considered to be social and recreational in nature. Big game hunting, fishing and especially berry picking are examples of activities that brought family, friends and neighbors together and provided for a social gathering in Teton valley.

were by the Shoshone and Blackfoot tribes, fur trappers, ranchers, sheepherders, European settlers and Forest Service employees developed the trail system in the analysis area. Very little can be found in records that indicate that any of the trails were designed and constructed for recreation purposes; instead, the trails were user created for the purpose of accessing hunting areas, gathering berries, fishing and moving livestock.

Three historic maps dated 1910, 1925 1932 and anecdotal information were used to determine locations and characteristics of the trail and road system on the Forest.

1910 Palisade National Forest Map

Trails

This map shows no trail system within the analysis area. It is possible that trail attributes were not intended to be displayed on this map due to the fact that the map shows Elk Flat Ranger Station with no trails or roads accessing it.

Roads

Following are the road attributes at that time.

- ✓ The only road on the south end of the watershed in the Snake River Range was Teton Pass which is in the same location as today.
- ✓ Pine Creek Pass road was located on the south side of Little Pine Creek.
- ✓ There was a road on the south side of Mahogany Creek.
- ✓ The road up Horseshoe Creek was on the south side of the creek and connected over to Packsaddle Creek and down to the town of Oasis (present day Kay ranch).
- ✓ There was a road going up Rammell Hollow and at the Forest boundary it went to Milk Creek.

- ✓ There was a road going to the Grandview Guard Station site and at the south end of that road in section 35 a road that went around Grandview Point.
- ✓ The main road into the valley from Rexburg came around Grandview Point off the Forest and went to Oasis and to Haden.
- ✓ There were many more roads west of the Teton River on private land than on the east side of the River.

1925 Targhee National Forest Map

Trails

The trail system in the Mahogany watershed was very rudimentary. The trail system at that time started at the Grandview Ranger Station and ran along the Big Hole Crest south to Elk Flats. At Elk Flats the trail ran southeast over Mahogany Ridge into Patterson Creek where the trail terminated. At the Grandview Ranger Station there was another fork in the trail system that ran south through the headwaters of Rammell Hollow and Packsaddle Creek and terminated at Packsaddle Reservoir.

Roads

Following are the road attributes.

- ✓ The only road on the south end of the watershed in the Snake River Range was Teton Pass which is in the same location as today.
- ✓ Pine Creek Pass road, a "main automobile highway", is on the north side of Little Pine Creek.
- ✓ A "road not passable to motors" entered the Forest on the south side of Mahogany Creek and just inside the boundary it crossed the creek to the north side of Mahogany Creek.
- ✓ There was a "main automobile highway" and railroad on the south side of Horseshoe Creek to Brown Bear Mine and a "main automobile highway" to Idaho Mine on the north and east side of the drainage. The railroad spur was completed to Brown Bear Mine in 1918 (Barrett 1973).
- ✓ A "road not passable to motors" went from Brown Bear Mine to Packsaddle Creek and off the Forest at the current location.
- ✓ A "road not passable to motors" went up Rammell Hollow and at the Forest boundary went north and crossed Milk Creek to Grandview Ranger Station.
- ✓ A "good motor road" went to Grandview Ranger Station from the north edge of the Forest.
- ✓ A "good motor road" came from Canyon Creek, around Grandview Point to the old Oasis townsite.
- ✓ Fewer roads are shown on this map on private land west of the Teton River than were shown on the 1910 map.

1932 Targhee National Forest Map

Trails

By 1932 the trail system had almost doubled in size with trails being established in South Fork Twin Creek, North and South Fork Mahogany, Mahogany Ridge, Grove Creek and Drake Creek.

Roads

Following are the road attributes.

- ✓ The only road on the south end of the watershed in the Snake River Range was Teton Pass which is in the same location as today.
- ✓ A "main motor highway" was located on the north side of Little Pine Creek.
- ✓ A "road not passable to motors" was on the south side of Mahogany Creek and just inside the Forest boundary, crossed the creek to the north side and went almost to Garns Mountain.
- ✓ A "main motor highway" was located on the south side of Horseshoe Creek and a railroad was located on the north side. These went to the Town of Sam. From Sam to the Forest boundary at Packsaddle creek, there was a "road not passable to motors".
- ✓ On the north side of Milk Creek, there was a "road not passable to motors".
- ✓ There was a "poor motor road" going to Grandview Guard Station along the Forest boundary.
- ✓ A "good motor road" came from Canyon Creek, around Grandview Point to the old Oasis townsite.

RECREATION CURRENT CONDITION

After World War II, American society and recreation changed dramatically. Fueled by population growth, increasing economic prosperity and technological advances a "recreation boom" occurred and is continuing yet today. The Targhee National Forest was no exception.

Presently in the Teton Valley area there are over 5,000 people that live within a 20-minute drive of the Mahogany Creek watershed and larger communities (Idaho Falls, Jackson, Rexburg) within a two hour drive. A large draw to this area is its scenic beauty and almost limitless recreation potential. Within close proximity to the analysis area is Grand Targhee Ski and Summer Resort, which has a tendency to draw a large proportion of young physically fit adults that use the adjacent National Forest year round.

1964 Driggs Ranger District Map

Trails

Trails in many situations were developed following the path of least resistance, locating the trail in very sensitive areas with unstable soil types, excessive slopes and in riparian areas. Other changes affecting the use of trails occurred during the early 1960's. The jeep, which was the workhorse of WWII, was redesigned in a variety of four-wheel drive models for recreational use. This same time period saw a boom in motorcycle sales due to the low cost of imported Japanese models (Joslin 1999).

The late 1960's brought about the use of snowmobiles as a primary winter recreation pass time. The all-terrain vehicle (ATV) became available to the public in the early 1970's. Trail systems were now for the first time being used by off-road vehicles, a use that trails were never designed and engineered for.

By 1964 the trail system in Mahogany watershed had grown to include trails in Milk Creek, Woods Hollow, South Fork Horseshoe Creek and Mahogany Ridge. The trail system was developed for access, hunting, grazing and not for recreational trail use.

Roads

Following are the road attributes for this era.

- ✓ There was a primitive road up Pole Canyon.
- ✓ Pine Creek Pass road was a paved State Highway.
- ✓ A primitive road about ¼ mile long up Grove Creek connected to a trail.
- ✓ Patterson Creek had a primitive road up the bottom. The access is shown with the old right of way south of the current access.
- ✓ Henderson and Dry Henderson had primitive roads in the canyons for about ¼ mile inside the Forest boundary.
- ✓ There was a primitive road in Mahogany Canyon to the Forks.
- ✓ There was a primitive road off the Forest in Middle Twin Creek that connected to a trail that went onto the Forest to Elk Flats.
- ✓ A primitive road coming off of Wood's private land and going towards Mount Manning, ending just before the mountain.
- ✓ There was a primitive road in Horseshoe/Packsaddle Creeks in the current location. There were several spurs off Horseshoe that must have accessed the coal mines. The spurs wet up Superior, Bear and Hillman Creeks. A spur was located south of Porcupine Creek and on the North side of Maytag's private land. There was a primitive road west of Dude Creek and up Woods Hollow within Horseshoe/Packsaddle Loop.
- ✓ The map indicated there was coal in the area where the Packsaddle Lake Road is now, but no road was shown on the map.
- ✓ There was a primitive road up Rammell Hollow.
- ✓ No other roads were shown on the map in the north end of the Big Holes.

In a 1967 ranger district multiple use plan for this District the statement was made "dirt roads are inadequate. Erosion is a serious problem. A more extensive road system is needed to harvest timber and serve grazing, recreation, mining, hunting, fishing and fire control".

2000 System Trails

System trails are maintained and managed recreational trails that are part of the Targhee National Forest travel plan. These trails should not be confused with non-system trails that can be found on the ground but have been user created and are not maintained or managed. Non-system trails are a challenging problem in the analysis area due to the overall number and lack of information on these trails.

The system trails provide access from Teton Valley to the Big Hole and Snake River Range. The current condition of the trail system is highly variable and is addressed on a trail-by-trail basis. However, with little to no trail maintenance occurring in the last 13 years on the Teton Basin Ranger District the overall condition of the trail system is poor to good. The majority of the trail system within the analysis area is currently being used by motorized traffic and receives moderate use. Within the analysis area there are a total of 68 miles of trails of which

23 miles are in the aquatic influence zone (AIZ). Most trails are heavily used for hunting. Hunters usually hike or ride ATV's or horses. Following is a description of system trails

Trail condition definitions are as follows:
Poor – Trail tread is over 50 percent lost in contiguous segments; heavy rutting is present; water drainage structures need replacing; trail brushing/clearing is needed.

Good – Trail tread is 10 to 49 percent gone in contiguous segments; light to moderate rutting is present; some water drainage structures are needed; trail brushing and clearing might be needed.

Excellent – Trail tread is in need of minor repair; rutting is just starting to occur in small isolated areas; cleaning of drainage structures might be needed; trail brushing and clearing limits are to standard.

Trail condition summaries are either the personal observations of Kurt Kluegel, Teton Basin Trail Coordinator or personal observations provided by J.C.Stimpson, Teton Basin Range Technician. Most of use occurring on the trails is by motorcycles, ATV's, mountain bikes, horseback riders and hikers. Deviations from these uses are noted in the trail descriptions. See Map 6 for trail locations.

- 060 – Carlton Cutoff. This is a motorized trail that starts from the north as a two track road and runs for approximately two miles before the trail tread is reduced to a 50 inch tread. The trail currently has a moderate amount of rutting and needs drainage work, especially in the portion that is a two track. Do to firewood gathering and other activities, there are numerous two track treads that lead off of the trail. This trail does not lie within an AIZ. In winter this trail is groomed for snowmobile use.
- 212 – Packsaddle Lake. This motorized trail is very steep as it drops in elevation to Packsaddle Lake from the north. The majority of trail switchbacks has been cut off by motorized use and is heavily rutted. The southern portion of the trail that leaves Packsaddle Lake Road and runs northwest to Packsaddle Lake is a two track road. The two track has allowed the transportation of jet skies into Packsaddle Lake. The ford across the lake outlet is in need of improvement. A small portion of trail is located in the AIZ adjacent to the lake.
- 056 – South Horseshoe. This motorized trail is probably the most heavily used trail in the analysis area. ATV's at this time can only travel the first 1.5 miles before the trail becomes too steep and narrow. There are numerous resource problems on this trail; multiple ATV tread in the meadows adjacent to the beaver ponds, three very steep stream crossings, an excessively steep trail that needs a re-route from the intersection with trail 057 to the ridge top and overall improvement of trail drainage structures. The trail is used as a sheep drive on the upper portion. A large portion of the trail is within an AIZ. This is the only developed trailhead in the Big Holes analysis area with a graded and graveled parking area, hitching rails and loading ramp.

- 195 – Nickerson Grove. The entire trail is a two track road. Due to truck traffic on the trail, there is very heavy rutting and major drainage problems. The Twin Creek ford is in need of maintenance work. This trail crosses one AIZ. The north half of the trail is used as a sheep drive. There is a light to moderately used non-system trail that leaves the trail and terminates at Alligator Lake.
- 069 – Twin Creek. This motorized trail follows Long Ridge. From the trailhead to the intersection of trail 195, this trail is a two track road. The rest of the trail has a 24 inch tread and is not used by ATV's. The trail is currently in need of basic trail maintenance and has no serious problems. This trail is heavily used and has parking for five to six vehicles at the trailhead. This trail is not located in an AIZ. Forest Service has no access right of way.
- 108 – Middle Twin Creek. This motorized trail is actually a user created road. This half mile long dead-end road is located in an AIZ and is in need of drainage improvements. There is no trailhead associated with this trail. It is often used to access forest products by adjacent residents. Forest Service has no access right of way.
- 057 – North Mahogany Creek. Motorized use is allowed on this trail however ATV's can only use the lower one to 1.5 miles and then the trail tread reduces to a 24 inch tread. The bridge has a broken stringer and is in need of replacement. A small segment beneath the puncheon (bog bridge) has been eroded away and needs leveling. Above the bridge there is a large exposed stream bank that is very actively eroding and under-mining the trail tread (identified slide area). At this location there is a user created trail re-route that does not meet any trail standard. The portion of the trail that lies just below the ridge top is very steep and has excessive gullies. The parking area at this time is inadequate to handle the demand and is located next to a water diversion that causes the first 200 yards of the trail to be flooded. Signing for the trail is inadequate. The majority of the trail is located in an AIZ.
- 070 – Dry Henderson. This motorized trail has become a very popular mountain bike trail in recent years. The overall condition of the trail is in poor condition with the need for drainage structure replacement and drainage improvements. The lower quarter mile of the trail is a two-track road that is in the AIZ. This trail has no true trailhead and is in need of signing. Half of this trail system, contrary to the name, is located in an AIZ.
- 071 – Wet Henderson. This dead-end motorized trail is in need of heavy maintenance due to rutting and the decomposition of drainage structures. From the trail origin, a two track exists for approximately one mile. There are non-system trails that emanate from this trail. The entire trail is located in an AIZ.
- 054 – Patterson. A motorized trail that has so many user created non-system trails intersecting it, that most users cannot follow the system trail. Signing and tree blazes are inadequate to allow for easy passage. This trail is in poor condition due to major drainage problems and large impacts from cattle. Forest Service at this time has no legal access to this trail. The trail starts out as a two track that has several stream crossings that are causing impacts to the AIZ. The majority of the trail is located in an AIZ.

- 211 – Henderson Cutoff. This motorized trail is difficult to find and is in a very similar situation to trail 054 with non-system trails intersecting the trail, drainage problems and inadequate signing. There are no AIZs associated with this trail.
- 030 – Government Pack Trail B. This is a non-motorized trail that has similar characteristics as trail 054 and trail 211. ATV's have tried to use this trail causing resource damage. This use is mostly during bow hunting season. This trail is located in an AIZ.
- 072 – Grove Creek. This motorized trail is comprised of many old road systems. The overall condition of the trail is poor with very heavy rutting and numerous two tracks and user created firewood-gathering trails that diverge from the trail. There is no trailhead, and parking is currently on private property. Forest users cannot access National Forest with a horse trailer. The trail lies within an AIZ. The portion of this trail that is in mine canyon is a non-motorized trail with similar conditions as trail 030.
- 053 – Big Hole Crest. This motorized trail runs along the west side of the analysis area boundary. ATV's currently cannot travel the entire trail do to rock outcrops and narrow trail tread. Users have created multiple treads around difficult areas causing resource damage. Most log waterbars have decomposed and are in need of replacing. There are many user created trails that diverge from this trail. This trail is in a sub alpine landscape open and easy for motorized cross-country travel. Most of these user created trails are on the south half of the trail and run down open ridges to the east and west of the trail. The trailhead is located on Highway 31. This trail is not within an AIZ.
- 073 – Drake Creek. A motorized trail that is in reasonably good shape. The trail has some drainage problems and needs to be brushed out. The trailhead is not functional for horse trailers and trailers have to park on private property. The trail is located in an AIZ.
- 079 – Rocky Peak. This motorized trail is in poor to good condition and is in need of heavy trial maintenance. Most log waterbars have decomposed and need replacement. There are user-created ATV trails that diverge off of the trail. This trail is not within an AIZ.
- 081 – Murphy Creek. This motorized dead-end trail is a two track road for its entire length. The trail is heavily rutted and needs heavy trail maintenance. The entire trail is in an AIZ. The trailhead is located on Highway 31.
- 014 – Allen Canyon. A motorized trail that is in good condition. Drainage work is needed due to the decomposition of waterbars. The trailhead is located on Highway 31. This trail is not located in an AIZ.
- 047 – Wood Canyon Ridge. This trail is a non-motorized trail that is very popular with the mountain bikers. Waterbars are currently non-functional and major drainage work is needed. The trailhead is located on Highway 31. The trail is not located in an AIZ.
- 052 – Smith Canyon. This motorized trail is similar in condition to trails 014 and 047. The trail is not located in an AIZ.
- 031 – BPA Power line. This designated trail is actually a constructed maintenance road for the BPA power line. Condition of this trail/road is

excellent, with maintenance being accomplished by BPA in 1999. The road has one crossing through an AIZ. This route is a very popular snowmobile route. This trail is not continuous; there is a break between Pole and Smith Canyon.

- 174 – Pole Canyon. This is a historic sheep drive and the effects can still be seen today. Currently only one to three bands of sheep are driven on the lower portion of this trail. The trail condition is good with some minor drainage work being needed. There is a user created motorized trail that cuts off of the trail and runs to the ridge top. The lower part of the trial is a two track road and crosses the creek. The trail is located in an AIZ.

Snowmobile Trail System

Within the analysis area there is 18 miles of groomed snowmobile trails, a small portion of the overall Big Hole snowmobile system. The trail system in this area receives a moderate amount of use. The 18 mile system runs south from the Forest Boundary along trail 060 over Grandview Point to the intersection with road 951. The trail splits and one fork runs east along road 951 to road 381 and then east off of the forest to a plowed parking area. The other fork follows the ridge south along road 663 to the junction with road 207; the groomed route then follows road 207 to road 508 to 235. Road 235 leads to a plowed parking area in Horseshoe Canyon. See Map XX for the location.

The groomed snowmobile system in the Big Holes was started in 1989 by the Forest Service using a snowmobile and grooming attachment. In 1991, a cooperative agreement was signed by all parties associated with Snowmobile Area #33, at this point in time and henceforth a full size groomer has been used.

2000 System Roads

System roads are part of the official Forest Transportation Management System; these roads usually have a number and name and are on the Forest travel plan maps (RFP page G-35). These were developed to provide access to areas in the watershed for recreation and logging. All of the system roads are surfaced with gravel or native materials. There are 68 miles of system roads within the watershed; 16 miles (24%) of the roads are located within an aquatic influence zone (AIZ). Most of the roads receive high use during hunting season (September – November). These roads are used by cars, trucks, motorcycles, ATV's, hikers, horseback riders, snowmobiles, skiers and bicyclists. Following is a description of system roads. See map XX for road locations.

- 913 – Sherman Springs. This is a gravel road that accesses the eastern portion of the watershed in the Snake River Range. It is a user created road receiving no maintenance from the Forest. It provides access to the BPA powerline and has recently (1999) been upgraded and maintained by BPA. Prior to 1999, the road received little maintenance. The Forest has no access right of way, however, Teton County may have a right of way. This road provides access to some nonsystem trails.

- 547 – Pole Canyon. The Forest constructed and surfaced this road with gravel. It provides access to a main trailhead into the Snake River Range and a water development. The Forest has no access right of way.
- 545 – Smith Canyon. This is a user created road that the Forest does not maintain. It provides access to the BPA powerline and was minimally maintained until it was graveled and upgraded by BPA in 1999. There is a dispute over right of way access and currently the Forest does not have an access easement. The road goes through private land and is not used much by the public. The road is located in an AIZ.
- 909 – Murphy Creek. This is a user created road that was upgraded by the Forest to access a timber sale in the early 1970's. The surface is gravel and has received little maintenance. It provides access to the BPA powerline. A portion of the road is located in an AIZ and has a bridge crossing Little Pine Creek. Until 1999 when BPA graveled and bladed the road it had ruts, rills and gullies. The Forest has no access right of way. This road has been managed as closed yearlong and the closure is enforced with a gate. This road receives high use. It provides access to trail 081, 014 and 047.
- Highway 31 – Pine Creek Pass. This is a paved state highway providing access between Teton Valley and Swan Valley. Most of the road is located within an AIZ. The highway was re-located to its present location in 1955 (District Fire Plan 1950-1955).
- 321 – BPA Road. This is a user created road that was graveled and graded to access the BPA powerline in 1999. Prior to this, the road had ruts, rills, gullies and overland flow. It has not received maintenance by the Forest, but was sporadically maintained by BPA. Since 1999 it has been closed year long with a gate. It crosses one AIZ.
- 546 – Grove Creek. This road was created by users over the years and has not been maintained by the Forest. It is constructed out of native materials. It is located in an AIZ and has two undeveloped creek crossing. For the first 200 feet west of the Forest boundary, the road is immediately adjacent to the creek and is feeding sediment to it. Off the Forest, adjacent to the boundary, water is running down the road and the road is failing in one spot and runs next to the stream. This road has been used to access forest products such as timber, firewood, post, poles, huckleberries and a water trough. The Forest has an access right of way. It provides access to trails that criss cross the Big Holes.
- 237 – Patterson Creek. This road was created by users over the years and has not been maintained by the Forest. It is constructed out of native materials and is severely rutted, making it virtually inaccessible to cars and trucks. This road is located in the AIZ and has at least three undeveloped stream crossings. The Forest has an access right of way on an old access point that no longer exists. The current access through the subdivision has no right of way agreement. It has been used to access forest products such as timber, firewood, post, poles and huckleberries and it provides access to trails
- 543 – Henderson Creek. This road was created by users and has not been maintained by the Forest. It is constructed out of native materials and is deeply rutted in places. This road is located in the AIZ and in two places the road crosses the creek causing the creek to flow down the road at low flow (D.Shaw 1993). The Forest has an access right of way. It provides access to an extensive trail system in the Big Holes. This road has been used to access forest products such as timber, firewood, post, poles and huckleberries. Dispersed camping sites are located at the head of this road.

- 544 – Dry Henderson. This road was created by users and has not been maintained by the Forest. It is constructed out of native materials and is deeply rutted in places. This road is located in the AIZ and water runs down the road during runoff or after a rainstorm. The Forest has an access right of way. It provides access to an extensive trail system in the Big Holes. This road has been used to access forest products such as timber, firewood, post, poles and huckleberries.
- 236 – Mahogany Creek. This road was created by users and has not been maintained by the Forest. It is constructed out of native materials and is rutted. This road is located in the AIZ and contributes some sediment to the stream (1990 stream survey). This road accesses an irrigation ditch, headgate and extensive Big Hole trail system. The Forest has an access right of way. This road has been used to access forest products such as timber, firewood, post, poles and huckleberries.
- 235 – Horseshoe-Packsaddle. These roads connect to form a loop and have provided access into the Forest for many years. Horseshoe follows the old railroad grade. Both roads are graveled and maintained by the Forest. They are located within the AIZ. The road is plowed in the winter to a snowmobile parking area. These roads provide access to private land within the Forest boundary. The Forest has an access right of way on both Horseshoe and Packsaddle. They provide access to heavily used trails. This road has been used to access forest products such as timber, coal, firewood, post, poles and huckleberries. Dispersed camping sites are located off of this road primarily along the Packsaddle Road.
- 802 – Maytag Road. This road provides access to two homesites and is used mostly during the snow free months by the landowners. It is maintained by the landowners and has a gravel surface. The road is within the AIZ.
- 088 – Irene Creek. This road provides access to private land and is maintained by the landowner. It is surfaced with gravel.
- 070, 073, 074, 075, 076, 135, 140 – Dude Creek Roads. These roads are located within Horseshoe-Packsaddle loop road and will be managed as closed during the spring, fall and winter to provide secure big game habitat. The roads have been closed to snowmobile use since 1977 (EA for East Slope of Big Hole Mountain Vegetation Manipulations 1979). These roads were built to access coalmines and the Forest from private land. They are constructed out of native materials. Portions of the roads are greater than 7 percent grade, rutted and access is difficult or impassible with a car or truck. They have not received maintenance by the Forest. Road 140 is within an AIZ.
- 508 – Packsaddle Dam Road. This road was constructed in 1909 to access Packsaddle Lake dam (Driggs 1970). It was built using native materials and has not been maintained by the Forest; portions of the road are impassible with a car or truck. The lower portion of the road (near road 235) is within an AIZ. There are large rocks, rills, gullies and ruts causing erosion on portions of the road. It has been used to access forest products such as timber, firewood, post, poles and huckleberries.
- 381 – Packsaddle Lake. This road provides access to private land at the Forest Boundary and was user created to access the trail to Packsaddle Lake. It received no maintenance and was deeply rutted until 1998 when the Forest graded and surfaced the road with pit run material. The Forest has an access right of way. . It is a groomed snowmobile trail. It has been used to access forest products such as timber, firewood,

post, poles and huckleberries. The upper end of this road is within the AIZ. There are dispersed camping areas at the head of the road.

- 663 – Grandview Main. Portions of this road are in the watershed. It was constructed to access Grandview I and II timber sales. It has been maintained by the Forest and is surfaced with gravel. There are some portions of the road that contain large rocks and ruts. The Forest has an access right of way on the old Crooked Creek road located in the same area as the present day road. It is a groomed snowmobile trail. It has been used to access forest products such as timber, firewood, post, poles and huckleberries. This road is one of three main entry points to the west side of the Big Holes.
- 951 – Milk Creek Ridge. This road has been managed as open but will be closed year long to comply with the Forest Plan. It was constructed to access Packsaddle Basin Timber Sale and has a gravel surface. It has been maintained by the Forest. It is a groomed snowmobile trail. It has been used to access forest products such as timber, firewood, post and poles.
- 207 – Birch Spur. This road was constructed to access Packsaddle Basin Timber Sale. It has a gravel surface and is maintained by the Forest. It is a groomed snowmobile trail. It has been used to access forest products such as timber, post, poles and firewood. This road provides access to Packsaddle Lake.
- 390 – Packsaddle Ridge. This road was constructed to access Packsaddle Basin Timber Sale. It has a gravel surface and is maintained by the Forest. It has been used to access forest products such as timber, firewood, post and poles.
- 219 – Relay Ridge Road. Portions of the road are in the watershed and it is one of three access roads on the west side of the Big Hole Mountains. This road was probably constructed to access the radio towers on the ridge. It has a gravel surface and has been maintained by the Forest. The Forest has an access right of way. It is a groomed snowmobile trail. There is a trail at the end of the road and dispersed campsites. It has been used to access forest products such as timber, firewood, post and poles.

2000 Nonsystem Roads

Nonsystem roads, two tracks, jeep trails, ghost roads are all names for roads that are not part of the official Forest Transportation Management System. These roads don't have a number and are shown on the Forest travel maps. It is not known how many miles of nonsystem roads exist in the watershed. These roads receive no maintenance, are made out of native materials, are developed by continued use and are most often used during hunting season. Within the next ten years, these nonsystem routes are to be closed to motorized travel (Travel Plan 1999). These routes are usually used by trucks, ATV's, horseback riders, motorcycles, snowmobiles, bicycle riders and hikers. Until June, 1997, cross-country motorized travel was permitted within the watershed. Implementation of the Revised Forest Plan restricted this use to motoized travel only on designated routes. This restriction has not been enforced and cross-country motorized travel still occurs.

Following is a list of known nonsystem roads, their location and condition. This information came from air photos and various District personnel who frequent the area.

- A nonsystem road extends from the county road in Drake Creek for about ½ to ¼ mile onto the Forest. There is one deeply rutted stretch where the stream appears to be higher than the road and throughflow is keeping the road wet. Water flows 200 feet down a wheel rut. Further up the road is an undeveloped creek crossing. There are at least two nonsystem roads to the south of Grove Creek. One follows the main stem of Grove Creek. The other crosses Grove Creek and is rutted. They provide access for firewood and huckleberry pickers.
- Two parallel, nonsystem roads are located on the ridge south of Patterson Creek. There is a cattle guard at the Forest boundary where the previous right of way access road went to the Forest. It is user created and rutted in places. It has been used to access forest products such as firewood, post, poles and huckleberries.
- There is one nonsystem road off of Patterson Creek to the south. It is rutted and has been used to access firewood, post and poles.
- There are several nonsystem roads south of Henderson Creek entering the Forest from private land. They are user created roads and have no surfacing. They have been used to access forest products such as firewood, post, poles and huckleberries. There is one road south of Henderson Creek that goes over the ridge to Patterson Creek. It is a steep two track that is rutted and eroding. It has been used to access forest products such as firewood, post, poles and huckleberries.
- There is one nonsystem road south of Dry Henderson that is steep. It has been used to gather firewood, post, poles, huckleberries and by the allotment permittee. There are two or three nonsystem roads on the south side of Mahogany Creek that are rutted and cross a small creek. They may have been used to access the old sawmills.
- There is a nonsystem road in the North Fork of Twin Creeks noted as Long Ridge Road on topo maps. This two track has ruts, rills and overland flow.
- There are four to five nonsystem roads north of Packsaddle road. They are on level to slightly sloping ground and have been used to access firewood. A total of 12 nonsystem roads have been noted off of road 235 on the Packsaddle side. Most of them are in the AIZ. There is a two track road that goes to the Packsaddle Mine that runs along the south side of Packsaddle Creek (Packsaddle Creek Riparian Survey 1993). A nonsystem road leading to Pintar Mine has many ruts, rills and multiple tracks.
- In Horseshoe Creek near the Forest boundary there are nonsystem roads in the AIZ. These are south of the current road and possibly are portions of the old Horseshoe road. The former entrance to South Horseshoe Trail is being used by wheeled vehicles and there is an unprotected ford crossing Horseshoe Creek to access the two track going up Superior Creek. ATV's and motorcycles use these nonsystem roads.
- There are four nonsystem roads off of 381. One of them is located within an AIZ and is rutted. The other two are on level ground; one of these roads connects road 381 and 951 and is often used as access to the west side of the Big Holes. It is also part of the groomed snowmobile trail. There is a jeep trail at the end of road 381 that continues up the ridge to the west and over to the west side of the Big Holes.

Road Densities

Motorized road densities have been established for each management prescription area within the watershed. Some of the prescription area boundaries overlap with the adjacent watersheds

and are not all within Mahogany Creek Watershed. The following table lists the prescription areas with the current road density and the road density required in the Forest Plan. These road densities do not consider the nonsystem roads so the current densities are higher than what is shown in the table.

Table 3-12. Road Densities

Management Prescription	Current Density (miles/square mile)	Required Density (miles/square mile)
3.2 (j)	1.1	0.5
5.1.3 (b)	1.5	3.0
3.2 (j)	1.2	0.5
2.7 (a)	1.9	2.0
5.1.4 (b)	2.0	1.5

Developed Recreation

Pine Creek Campground is the only developed recreation site in the analysis area. It was constructed in 1962. Located 6.5 miles west of Victor, Idaho and adjacent to Highway 31 (Map XX), this campground has a small stream that runs through the campground and a mixture of large conifers and aspen. the Forest Service maintained the campground until 1999; it is now operated by a private concessionaire under a contract administered by Teton Basin Ranger District. Statistics from 1999 show that 653 people and 349 vehicles visited the campground. These numbers reflect approximately a 75 to 80 percent compliance rate and no numbers are available on use after September when fees are not collected.
Facilities include:

11 Family sites
2 Vault toilets
1 Garbage dumpster
No water system – the previous water system was a spring development and is no longer in use.

Due to the age and use, many of the facilities are in need of repair or replacement. One of the toilets has a cracked vault that is leaking into the ground water. Other problems found at the campground include, parking sites that are too small to accommodate modern RV's, accessibility is deficient and bridges and footpaths are in need of maintenance.

Dispersed Camping

There are a few areas in the analysis area that have moderate to heavy dispersed camping areas, Horseshoe/Packsaddle Loop Road (235), Packsaddle Springs and Rammel Hollow Road (381). These areas are easily accessible due to close proximity to an urban area. With the exception of hunting season, these areas provide use for such activities as day hikes, walking the dog, target shooting, berry picking, wildlife watching and parties. The majority of use and impacts at these dispersed camping areas are attributed to hunting season. Currently there is a 16 day limit on camping in one site on the Targhee National Forest.

In the Horseshoe/Packsaddle area there are four to five popular dispersed camping areas located next to the road and total seven to eight acres in size. A 1999 survey indicated that trampling damage was occurring at these locations (Ovard 1999).

Packsaddle Springs has three heavily used dispersed camping areas that are located in close proximity to the spring. The total area that is impacted by camping is less then two acres.

The Rammell Hollow area above Packsaddle Lake has moderate use and the dispersed camping areas are located on a rocky ridge that has little to no vegetation due to the harsh site. Total dispersed camping area is less then an acre.

Areas with light to moderate dispersed camping are on the east side of Packsaddle Lake with two to three sites and Henderson Creek with two sites. Packsaddle Lake dispersed camping is used primarily for weekend camping and during hunting season. With the use of trail 212 being "pioneered" closer to Packsaddle Lake over recent years there has been an increase in dispersed camping due to easy access. Dispersed camping at the Henderson trailhead is used primarily during hunting season and is less then a quarter acre in size.

Outfitter and Guides

Two to three big game guides were operating in the analysis area in the 1940's and 50's Records of their use are non-existent because the forest didn't require a special use permit unitl 1970. Records indicate that up until 1980 most of the operators were primarily outfitting for big game. From 1980 to the present the outfitter and guides have changed dramatically with big game hunting becoming the exception not the rule. Guiding in recent years has shifted to mountain bike tours, educational nature hikes, ski and snowshoe tours, backpacking, snowmobile tours and horse riding trips.

Currently there are seven outfitter-guide special use permits in the analysis area. A description of their use follows.

- Dale Robson is permitted to conduct snowmobile tours, big game hunting, day use and overnight horseback trips. Winter use is limited to 300 service days and Fall/ Summer use is limited to 150 days. In recent years Robson has not used all his allotted days in the analysis area, in fact in 1999 Mr. Robson did no guiding in the analysis area. Mr. Robson's assigned site (camping area) is located in Elk Flats, which is outside of the analysis area.
- Hole Hiking Experience is permitted to conduct summer overnight backpacking trips within the analysis area. Use is limited to 150 days in the Big Hole Mountains of which only a portion of those days will be in the analysis area.
- Prescott College is permitted to operate seven days per year at Pine Creek Pass and Rocky Peak. Use is limited to day use only for a winter education class.
- Bennion Teton Boys Ranch/Quickwater Ranch is permitted to operate 25 days in Pole Canyon and Drake Creek. Use in these areas will consist of day use trail rides of up to 12 horses, and overnight backpacking trips.

An outfitter and guide capacity study for the Big Hole Mountains was completed in 1999 by the Teton Basin Ranger District. The conclusion of the study indicated that special use permitted service days could increase 1,170 days before low capacity objectives are achieved.

Currently there are five new special use permits being processed on the district.

Inventoried Roadless Areas

There are two inventoried roadless areas within the analysis area, Palisades Roadless Area at 6,302 acres and Garns Mountain Roadless area at 19,527 acres for a total of 25,829 acres that lie within the analysis area. The Revised Forest Plan states that the Idaho portion of the Palisades Roadless Area is recommended for wilderness designation. In this area, roadless values will be protected to ensure wilderness characteristics (Revised Forest Plan, p. III-60). The Garns Mountain Roadless Area was not recommended for wilderness for the following reasons (1997 Revised Forest Plan, Final Environmental Impact Statement, p. B-3):

- The area is currently used for motorized and non-motorized travel and is considered important by all user groups.
- Forest Plan Revision designates this area for motorized use on trails.
- Support and opposition are often very vocal concerning this area's recommendation for wilderness.
- There are no significant biodiversity features within this area that warrant special consideration, although there are areas within the roadless area having high value resources.

CHAPTER 4
SYNTHESIS

This chapter discusses the trends found for each issue (described in Chapter 2) and the reasons for the trends. Trends for other resources are also discussed. The team decided to include trends other than those associated with the issues because they discovered useful information while conducting their research. The trends were developed by comparing reference and current conditions and answering the Key Questions posed in Chapter 2 for each issue.

Desired future conditions (dfc) were developed for each issue based on the range of natural variability (reference condition), laws, the Revised Forest Plan and public requests. DFC's are a goal that the Forest will attempt to reach to sustain the ecosystem functions. Recommendations were made for each trend that would move the landscape closer to the desired future condition.

The chapter is organized by issue (bold type) followed by their trends (numbered statements) and the causes of the trend (lettered statements). The trends and causes are not listed in order of importance. DFC statements for each resource follow the causes of the trend. Recommendations (check marks), listed in no particular order, are below each DFC.

Water Quality and Riparian Function Trend

Water quality and riparian function have decreased since reference condition for the following reasons.

1. Increase in sediment especially in Horseshoe, Packsaddle, Mahogany, Patterson, Henderson, Dry Henderson, Drake and Grove Creeks.

Reasons:

a. Construction and use of trails and roads.
b. Coal mining in the Horseshoe and Packsaddle drainages.
c. Sheep grazing on ridges and cattle grazing in riparian bottoms. Erosion from ridges continue to be a problem. Henderson and Patterson have continuing utilization issues from cattle grazing.
d. Natural sloughing, erosion and landslides especially in Mahogany Creek.
e. Dispersed camping
f. ATV's, motorcycles, jeeps, 4x4's pioneering new routes.
g. Use of wet trails especially horse use.
h. Prescribed burns
i. Logging in intermittent streams and on private land.

2. Incising or downcutting of the stream channels.

Reasons:

a. Vegetation removal through grazing increased water yield.
b. Large woody debris (LWD) helps prevent downcutting. Firewood cutting decreased LWD in areas that are accessible. In the higher elevations of the drainages LWD has increased. See forested vegetation discussion.
c. When beaver dams blew out, the stream gradients increased and the channels downcut. A blown out beaver dam can act as a nick point if there are not active beaver to repair

the site or stablize dams upstream or downstream. Beaver dams decreased flow and spread the runoff over longer time periods. With the majority of beaver removed form the systems that evolved with them, the streams became very susceptible to major changes.

d. Culverts and bridges in Horseshoe, Packsaddle have narrowed the stream channel and increased donwcutting. Undersized culverts and bridges decrease the channel width and roughness through which the water flows. In order for the same amount of water to pass through, the velocities increase resulting in increased erosion and downcutting of the channel. Road construction in the riparian areas can constrict and narrow the stream channel causing similar effects.
e. The manmade dam on Packsaddle Creek may have had major impacts when it failed.

Loss of beaver and streamside vegetation causes the stream to lose its bank stability resulting in breached dams, loss of sinuosity which increases stream gradient and velocity which in turn increases stream bed down cutting.

3. Decrease in floodplain connectivity.
   Reasons:
   a. Result of downcutting. See donwcutting discussion above.
   b. Roads intersecting or adjacent to floodplains.

4. Decrease in riparian plant communities and deep rooted species.
   Reasons:
   a. Downcutting
   b. Grazing
   c. Change in soil types
   d. See riparian nonforested vegetation discussion.

5. Decrease in bank structure.
   Reasons:
   a. Cattle grazing
   b. Downcutting
   c. Decrease in riparian vegetation

6. Decrease in resiliency and in ability to withstand floods.
   Reasons: See #2, #3, #4, #5

The main impacts to the functioning of the streams within the watershed are roads, grazing, removal of beaver, and changes in runoff patterns due to changes in vegetation. Not all the impacts occur on every stream. Roads are the most universal impact. The area with the most widespread damage by grazing is the Westside Cattle Allotment. Most other allotments have localized damage or damage related to practices that are healing.

DFC for water quality and stream function: Stream channel integrity, channel process and sediment regimes are maintained consistent with associated landforms. Channel stability would be rated as good to excellent.

Recommendations:

- ✓ Reduce sediment input into streams by maintaining roads and trails. Maintenance methods could be surfacing (the type would depend on the road or trail location), providing proper drainage, relocating or installing properly sized culverts and bridges at stream crossings. Redesign roads and trails to meet engineering specifications. Culverts and stream crossings found to pose a risk to riparian, wetland or aquatic conditions will be improved to accommodate at least a 50-year flood " (RFP page III-110). "Roads and trails or sections of them that have been identified as inhibiting riparian, wetland or aquatic ecosystem processes and/or functions will be improved, relocated, or obliterated"(RFP page III-110).
- ✓ To reduce mining impacts, remove mine tailings from drainages and flood plains. Stabilize tailing piles so they can't erode into streams.
- ✓ To decrease sediment input and streambank downcutting move cattle out of stream bottoms daily. Enforce grazing standards in the RFP. Convert Westside Allotment to a sheep allotment. Protect areas from grazing that have had past downcutting problems.
- ✓ To reduce erosion, management practices should not aggravate the natural slide areas or areas with potential to slide. Relocate roads and trails if there presence and use is aggravating slide areas.
- ✓ Inventory dispersed camping sites. Harden dispersed camping sites and the access roads. Eliminate dispersed sites where sediment input into streams cannot be eliminated. Restrict access to dispersed sites so no new roads are created. Rehabilitate sites that are no longer being used or use is eliminated.
- ✓ To prevent pioneering and use of nonsystem roads and trails, sign as closed to motorized use, enforce the travel plan, decommission the road or trail to prevent motorized use, educate and inform users.
- ✓ To prevent sediment from entering into streams from roads and trail recreational use during wet seasons consider educating users about the damage that is caused, seasonal closures, altering trails so that use during wet seasons is not a problem.
- ✓ To prevent sediment from entering the system due to prescribed burns, decrease area burned with project perimeter, complete the burn in spring so that new plants will slow sediment input or design burn units with a buffer around the riparian area.
- ✓ To prevent sediment from entering the system through logging practices, enforce BMP's especially for logging within intermittent streams.
- ✓ To reduce downcutting along stream banks, reintroduce woody vegetation into the system. Plant willows.
- ✓ To maintain LWD within the riparian areas, do not allow firewood cutting in riparian areas where LWD has been removed.
- ✓ To increase beaver populations, reintroduce beaver in stream reaches that are suitable and unoccupied.
- ✓ Ensure that culverts and bridges are sized properly to fit the stream to prevent further downcutting.

Fish Trend

Populations of Yellowstone cutthroat trout are decreasing. Available data indicates cutthroat trout have increased in Horseshoe, Packsaddle and Mahogany Creeks. This increase may be

related to the stocking of these streams with Henry's Lake cutthroat. Listed below are reasons for the decrease in cutthroat since reference condition.

1. Connectivity between the main stem of the Teton River and the tributaries has been cut off or lost. This has resulted in the elimination of genetic exchange with fish from the Teton River, Henry's Fork and Snake River. Lack of connectivity limits the ability of these streams to repopulate after disturbances or local extinction.

Reasons:

a. Irrigation dewaters the streams so they don't reach the Teton or they are diverted to another course. Diversions also may not dewater the stream but may form impassable barriers eliminating fish migration.

b. Culinary use diversion on Patterson
c. Diversion (dam) on Mahogany Creek on private land (Buxtons) is a barrier to fish swimming further than the dam.
d. Manmade ponds on private land are another form of diversion or barrier.
e. Conversion of aspen to conifer increases evapotranspiration and water does not flow into the system, decreasing the amount of water available in the streams.
f. Loss of beaver dams that provided late season water storage and release.

2. Non-native brook and rainbow trout populations are increasing and exist where historically they were not present. Brook trout prey on cutthroat trout. Brook trout generally out compete native cutthroat trout for available habitat. Brook trout under some conditions have a competitive advantage over cutthroat trout and over time can replace cutthroat and become the only salmonid in the stream. The primary threat from rainbow trout comes from their ability to hybridize with the cutthroat threatening the genetic integrity of the cutthroat stock.

Reasons:

a. Streams that contain brook and rainbow trout were stocked at one time. During the early 1900's peaking after WWII and even up until the 1970's, most headwater streams were indiscriminately stocked with trout species of all kinds using what has been called the "Johnny Appleseed" method (Behnke 1992). Kerry Buxton (pers. comm. 2000) reports "old timers" hauling fish in milk cans up most of the streams on the east side of the Big Holes. More recently Idaho Fish and Game has stocked the streams.

3. There has been a decrease in cutthroat trout habitat.

Reasons:

a. Decrease in beaver populations has lead to a loss of winter habitat and degraded riparian conditions. Removal or decrease in beaver dams has caused downcutting, lowering of the water table and loss of riparian vegetation especially in Packsaddle Creek. Problems that have been noted due to a lack of beaver are receding riparian plant communities, degradation of stream channels and disrepair of dams leading to sediment release.
b. Increase in sediment due to trampling by livestock, roads and trails located in the riparian zone or improperly constructed and maintained roads and trails.
c. Loss of bank structure due to a change in the hydrology, loss of vegetation, grazing, roads and trails.
d. Loss of shade along streams.
e. Increase in water flows from a decrease in vegetation.

f. Loss of cutthroat production in the Teton River and repopulation of the tributaries due to lack of spawning sites in the tributaries.

DFC for fish: A viable, self-sustaining population of native fish species such as Yellowstone cutthroat trout is present in the streams that sustained historic populations.

Recommendations:

- ✓ Increase connectivity to the Teton River by restoring instream flows, eliminating instream diversions in cutthroat trout streams and maintaining current flows.
- ✓ Increase beaver populations by reintroducing beaver in stream reaches that are suitable and unoccupied.
- ✓ Decrease or eliminate brook trout populations. Increase creole limits. Do not stock or introduce non-native fish species into streams. Educate fisherman as to the differences between brook and cutthroat trout.
- ✓ Priority areas to maintain current native fish populations are Horseshoe, Little Pine, Wood, Murphy and Mahogany Creeks. The best populations are in these streams; it is desirable to maintain and enhance them.

Trends in Soil Conditions

The locations of roads, trails and coal mining activity at the toe of the slides along Packsaddle Creek, Horseshoe Creek and Mahogany Creek reduces the stability of the slides. Minor additional movements of the slides are anticipated as maintenance and relocation of the roads and trails continues. Mine spoil stabilization may also cause minor slide movements.

The underground mining of approximately 100,000 tons of coal in the analysis area since 1903 has resulted in subsidence of the surface, altered drainage of mountain slopes, unstabilized spoil piles and unhealed mine areas and access routes. The extent of surface alteration and contamination of soil and water needs more complete documentation and ultimately rehabilitation. Forest Service files note problems along Packsaddle Creek and specifically with the Mikesell, Idaho and Pintar mines.

Roads also tend to concentrate runoff and provide sediment to adjacent drainages (Ketcheson 1996; Packer 1977; Taylor 1999). Roads and trails that are not maintained, have damaged surfaces, have poor drainage and have no effective design, especially in Aquatic Influence Zones, are the most troublesome (Foltz 1990; Burroughs 1989). Forest Service files have identified road and trail problems in Henderson, Patterson, Mahogany, Packsaddle, Horseshoe, Grove, Drake and Pole Creek drainages.

Trends in Forested Vegetation

Forested Vegetation has changed from reference condition to current condition**.** A discussion by species follows.

1. Mixed conifer - composition has changed to more subalpine fir, age class has shifted from young to mature. Stand densities are similar or have decreased slightly. Patch size is similar or increased slightly. Increase in standing and down dead.

Reasons:

a. Increase in amount of subalpine fir is due to succession and lack of low intensity fire that would have killed understory subalpine fir. This is especially prevalent in lower elevations adjacent to non-forested vegetation communities.
b. There is more mature timber within this vegetation type because of succession and lack of disturbance such as fire.
c. Patch size may have increased slightly due to succession of conifers, especially subalpine fir, into aspen, mountain brush and sage/grass areas.
d. Increase in dead and down is result of mountain pine beetle, subalpine fir mortality complex, competition and succession.

2. Lodgepole pine has experienced a shift in stand ages from young to mature. Change in species composition to more subalpine fir in the understory. Increase in lodgpole pine dominated stands. Stand densities have decreased. Increased standing and down dead. Changed patch size. A change in soil characteristics

Reasons:

a. The shift in age classes and change in species composition is due to succession and lack of low intensity fires especially in lower elevations adjacent to non-forested vegetation communities.
b. Change in stand densities and increase in dead and down material is result of mountain pine beetle, competition and succession.
c. Change in patch size is a result of logging. The clearcuts do not follow the natural vegetation pattern. The clearcuts are smaller than what would have naturally burned in a stand replacing fire. There are 200 to 600 foot leave strips between units that would not have historically existed.
d. Clearcuts in Douglas fir resulted in lodgepole pine regeneration, converting the Douglas fir to lodgepole pine.
e. Some areas within the more recent timber sales especially landings, show detrimental soil compaction, displacement and burning. The older logging associated with early settlement has had little impact to soils since most of the areas were logged in the winter.

3. Aspen stands have shown a shift in age class from young to mature, an increase in conifers within aspen stands, an increase in soil acidity and decrease in organic matter where conifers are more prevalent. Decrease in site productivity, decrease in understory forage where conifers are more prevalent and decrease in patch size.

Reasons:

a. Young aspen has decreased in the area due to successful fire suppression for the last 90 years. The fire return interval for aspen is 40 to 45 years; theoretically two fire intervals have been missed.
b. Successful suppression of fire for the last 90 years has allowed succession to progress towards climax conditions increasing conifers in the aspen stands.
c. Aspen succession to conifer impacts the soil. Reduced aspen canopy cover over time equates to a reduction in organic matter inputs from leaf fall. The needle fall of conifers slowly changes the reaction of the soil surface to slightly acidic. Over time the soil surface lightens and productivity of the site is reduced.

d. An increase in conifers in aspen inceases canopy closure reducing the herbaceous understory common under aspen and further reducing the input of organic material to the soil surface.
e. Decrease in patch size is result of succession by conifers and development of private land for agriculture and houses. Development has also changed the species composition of what was once an aspen community. The previous aspen stands may now be in agriculture production or yards for homes.

4. Douglas fir has experienced a shift in age class from young to more mature; increase in subalpine fir in the understory; increase in standing and down dead material; decrease in stand density; and decrease in Douglas fir stands.

Reasons:

a. Succession and lack of low intensity fire has caused the shift in age class and more subalpine fir in the understory. Fire return interval for Douglas fir is 15 to 100 years; theoretically one or more interval has been skipped.
b. Increase in dead and down and decrease in stand density is result of competition, succession and bark beetle.
c. The decrease in Douglas fir dominated stands has occurred where Douglas fir was clearcut in the north end of the watershed. These stands were regenerated to primarily to lodgepole pine.

5. Englemann spruce shows an increase in subalpine fir in the understory and an increase in standing and down dead.

Reasons:

a. Lack of low intensity fire and succession have increased subalpine fir in the understory of Englemann spruce stands. The fire return interval for this species is between 25 and 350 years. Increase in dead trees is a result of subalpine fir mortality complex and competition.

All of the forested conifer vegetation types are within their natural range of variability as disturbance intervals are much greater (100+years) than non-conifer communities.

DFC for forested vegetation: Ecosystem sustainability and resiliency will be provided within the forested vegetation community; able to withstand catastrophic events. Vegetation composition, structure and function will reflect historic disturbance regimes. Conifers are maintained within seral stages of 20 percent seedling/sapling/grass and 80 percent young to old forest. Aspen is maintained with a diversity of age classes at the following levels.

- 10 to 30% in seedling/sapling/brush. The trees would be 0-3 inches in diameter, 0-20 years old, have greater than 40% canopy cover over 5 acres of aspen and less than 10% canopy cover of conifers.
- 10 to 30% in young vegetation. The trees would be 3-8 inches in diameter, 10-60 years old, less than 10% conifer canopy cover with the some fir seedlings in the understory.
- 20 to 40% mature forest. The trees would be at least 8 inches in diameter, 50-100 years old, greater than 60% crown cover of aspen, less than 20% crown cover of conifers, some fir seedlings in the understory and very few dead trees.

- ❖ 20 to 40% old forest. The trees would be at least 8 inches in diameter, greater than 100 years old, less than 60% canopy cover of aspen, greater than 20% canopy cover of conifers, fir seedlings and saplings in the understory and some dead trees.

Note: percentages within age classes are based on wildlife needs, fire regimes and ability to sustain a resilient aspen community in the ecosystem.

Recommendations:

- ✓ Digitize aspen stands from 1943 and 1995 air photos to compare historic and current patch size and location of seral aspen stands. Use this information to determine potential treatment areas to achieve the DFC for aspen.
- ✓ Burn mature aspen stands to restore seedlings. Potential treatment areas are Horseshoe, Henderson, Mahogany, North and South Twin, Grove and Drake Creeks. Use management ignited fire to restore fire to this vegetation type. This will require a shift in management philosophy to ignite fires in the summer.
- ✓ Use mechanical treatments to achieve the above goals for conifers and aspen stands.
- ✓ Allow natural fires to burn in the Big Holes.
- ✓ Reduce fuels in identified natural fire containment area before allowing natural fires to burn.
- ✓ Reduce fuels around private land to provide ecosystem resiliency and maintain mature timber.
- ✓ Provide products to the public such as firewood, sawlogs, house logs, posts and poles to incrementally achieve the above goals.
- ✓ Educate the public about the risks and benefits of living in and adjacent to forested vegetation to prevent future reduction in forested vegetation.
- ✓ Use herbicide to treat aspen.
- ✓ Use livestock to promote brush in aspen stands.
- ✓ Prevent pathogens from killing trees along urban interface to decrease fuels. Promote disease and insect resistant trees and/or species; maintain lodgepole at densities that are not susceptible to bark beetles, promote aspen instead of conifers, manage Douglas fir stands for less downfall to keep bark beetle populations low. These suggestions will decrease fuels build up that may fuel a catastrophic fire and decrease ecosystem resiliency.
- ✓ Prevent livestock from grazing in seedling stands (especially aspen) to maintain that age class. Return grazing with interdisciplinary review.
- ✓ Cut conifers to rejuvenate aspen adjacent to drainages where want to promote beaver populations.
- ✓ Don't cut or burn forested vegetation in the following areas:
  - Slopes > than 40%
  - Landslide prone areas
  - Lynx denning/security habitat unless the characteristics need to be maintained

The team designated areas in the watershed where **old growth** should be maintained or enhanced. These areas were highlighted to benefit wildlife habitat. These areas must be verified and 300 acre blocks designated. Old growth and recruitment stands are located:

- Between Patterson and Grove Creek
- Between Mahogany Creek and Dry Fork of Henderson

- Areas north of Packsaddle Creek and east of Carlton Cutoff Trail

See Map 8 for stand locations. The old growth stands identified in the north end of the watershed are fragmented and adjacent to clearcuts where old growth potential is not likely and were not considered for old growth maintenance.

Trends in Non Forested Vegetation

Non Forested Vegetation has changed from reference condition to current conditions in the following manner.

1. Decrease in bunch grass on ridges. Increase in bare ground on ridges. Increase in erosion.

   Reasons:

   a. Heavy sheep grazing from 1900-1950.
   b. Since 1950 when grazing numbers were reduced, bunch grass density has increased. The amount of erosion and bare ground is also less, but the trend is a lot slower.

2. Decrease in tall forb complex. Increase in annual forbs and invader forbs. Increase in bare ground.

   Reasons:

   a. Heavy sheep grazing from 1900-1950.
   b. Stand replacing fires may have been hot enough in some areas that the stand was not able to regenerate in the hotter areas. This would have been in combination with heavy sheep grazing.

3. Shift in age class in the mountain brush communities from young to mature and decadent. Decrease in patch size. Minor impacts to soils.

   Reasons:

   a. Successful fire suppression for the last 90 years. Fire return interval is 20-40 years indicating two to four intervals have been skipped.
   b. Heavy grazing reduced fine fuels to carry fires.
   c. Increase in big game numbers in the 1940's and 50's browsed existing plants including new shoots.
   d. Natural succession of conifers into the mountain brush communities due to lack of fire.
   e. Development of land for agriculture and houses in and outside of the Forest boundary removed mountain brush communities from the ecosystem.
   f. The impacts to soil are reduced productivity of the sites due to increase in conifers that reduce the organic matter input. The increased canopy cover of older sagebrush traps more snow and more water infiltrates to greater depths in the soil when the snow melts.

4. Shift in age class in the sage/grass community from younger stands to mature and late seral stands. Shift in proportions of sage and grass to more sage. Reduction of patch size.

   Reasons:

   a. Successful fire suppression for the last 90 years. Fire return interval is 20-40 years.
   b. Sage canopies developed and shaded out the grasses and lower canopy species.
   c. Natural succession of conifers into the sage/grass community due to lack of fire.
   d. Development of land for agriculture and houses in and outside of the Forest boundary removed significant amounts of sage brush communities from the ecosystem.

5. Decrease in Carex spp. and increase in Poa spp. in riparian areas.

Reason:

a. The principal cause of this change is a drop in the riparian water table due to incising of the stream channels.
b. Increase in cattle grazing in riparian areas from 1900 to 1950.
c. Decrease in beaver populations caused a change in hydrology increasing stream downcutting and drying of riparian areas.
d. Poa pretensis was seeded in some areas.

6. Riparian willows have decreased, are more mature and have very few seedlings.

Reasons:

a. Reduction of beaver dams dropped the water table and eliminated the trapping of water where willows can seed in. Regeneration of willow is dependent on disturbance such as caused by beaver.
b. Lowering of the water table has decreased the resiliency of willows to grazing by livestock.
c. Use by beaver and heavy utilization by livestock can eliminate or reduce willows.
d. Lack of fire within the riparian zones to aid in willow sprouting. Fire cycles in the riparian areas are tied to the surrounding vegetation communities.
e. Downcutting of the streambanks has lowered water tables.
f. With the loss of beaver in many of the creeks for up to 150 years, the natural age variation in the willow community has shifted toward an older and less vigorous condition.
g. Willow dominated lands have been affected by land uses. Livestock grazing and clearing for pasture and row crops have affected many areas. Some species of willow reproduce vegetatively, but improper grazing can eliminate much of the regeneration. Willows along some stream reaches have been almost completely eliminated. Grazing, which tends to eliminate willow and dogwood, changes the composition of some understories to hawthorn and grass.

7. Mountain mahogany communities have experienced a shift in age classes from young, resilient plants to mature, late seral stages. Patch sizes have increased. Decrease in fine fuels. Minimal impacts to soils in the area.

Reason:

a. Shift in age class may be within the natural range of variability. We don't know enough to determine when seeds would establish. Mahogany will seed into areas where it has a competitive advantage; such as thin, nitrogen poor soil on rocky outcrops.
b. Mahogany has increased its patch size by moving into deeper soils adjacent to the rock outcrops. These areas would have traditionally burned within the historic fire intervals (20 to 40 years). Mahogany is a fire avoider and usually grows on rocky areas where fire does not often occur.
c. Increase in browsing may have affected seedling survival when the deer populations were high. Competition in the understory in the deeper soils may be too great to allow seedlings to establish.

8. Decrease in non-forested vegetation patch size.

Reasons:

a. Development of private land for agriculture and yards for houses has changed the composition and size of all the non-forested vegetation types.

9. Addition of exotic grasses and an increase in noxious weeds such as leafy spurge, musk thistle, Canada thistle.

Reasons:

a. Seeding of exotic grasses rather than native species. They grew faster and native seed was not available.
b. Transported by livestock, motor vehicles, big game, roads and trails, logging. Any disturbance will provide an area for exotic species establishment.
c. Channelization of the streams has contributed to the loss of diverse native complexes and caused increases in upland plant species in the stream areas which includes introduced exotic grasses such as timothy and smooth brome and noxious weeds such as Canada thistle and Musk thistle.

Note: There was a decline in general range condition from 1900 to 1940 due to extensive grazing. From 1940 to present the range condition has improved due to decreased stocking rate and season of use.

DFC for Non Forested Vegetation: Vegetation structure, composition and function will reflect historic disturbance regimes. Upland and riparian shrubs (mountain brush, sage/grass, mountain mahogany and willow) communities will exhibit a variety of age classes. Grass, carex and tall forb plant communities are maintained at a mid to late seral stage.

Recommendations:

- ✓ Reduce sheep grazing intensity on bunch grass communities on ridges and in tall forb communities through adjustment of numbers and season of use.
- ✓ Enforce grazing standards as outlined in the Revised Forest Plan.
- ✓ Focus on the bunch grass communities located on ridges during utilization monitoring.
- ✓ Map extent and condition of tall forb communities.
- ✓ Increase beaver populations to provide suitable willow habitat.
- ✓ Introduce fire into riparian areas to stimulate willow growth. Allow fire to creep into riparian area rather than start fire in riparian area. Fires should be low intensity and patchy.
- ✓ Seed riparian areas with native seed and plant willows in highly disturbed sites.
- ✓ In the mountain brush and sage/grass communities, introduce fire along with no to moderate grazing and browsing to allow new plants to grow. The decision to re-enter the burned area with grazers will be made by an interdisciplinary team.
- ✓ Harvest conifers in combination with low intensity fire to establish mountain brush and sage/grass within their natural patch size.
- ✓ Treat aspen where mountain brush is a component to increase mountain brush and aspen seedlings.

- ✓ Educate private landowners about the value of these species and encourage restoration. Cooperate with other agencies (IDF&G, WYG&F, TRLT, BLM) to further this education and restoration.
- ✓ Promote conservation easements on adjacent private land to conserve the natural plant communities.
- ✓ Acquire private land within the Forest boundary.
- ✓ Introduce fire into sage/grasslands to achieve age diversity in the communities on the hillsides.
- ✓ Administer SPIKE on sage on hillsides to achieve age class diversity.
- ✓ Collect data to determine sage species present and apply proper treatment.
- ✓ Mountain mahogany – To regenerate this species seed trees must be left and little to no soil is preferred. Burn areas in a mosaic pattern. Perform a seed tree with reserves cut. Plant seedlings that are inoculated with actinoryzae. Protect seedlings from browsing. Do not reduce patch size as it is an important species for big game; it is within its range of natural variability. Treat a small patch to figure out how this species reacts to treatments. Research past treatment.
- ✓ Before implementing mahogany treatments associated with the Big Hole Vegetation Project (1998) conduct an interdisciplinary review to determine the best treatment and follow the above recommendations.
- ✓ Implement a vigorous noxious weed treatment program including integrated pest management.
- ✓ Introduce predator bugs in leafy spurge or treat by hand. Consider risks with introduced bugs.
- ✓ Survey burn units prior to burning to decide if noxious weeds are present and what the problems will be after the burn is accomplished.

Trend in Lynx Populations

Lynx populations have decreased since pre-settlement.

1. Decline in lynx populations.

   Reasons:

   a. Trapping and direct take when performing predator control. Lynx were sometimes the target species and other times the take was incidental.
   b. Development of highways. This leads to direct kills when attempts are made to cross.
   c. Developments of population centers such as towns, communities and cities. This restricts the movement of lynx.
   d. An increase in fox, coyote and bobcat populations at higher elevations in the winter have lead to habitat competition.

2. Increase in snow compaction allows access to fox, coyote and bobcats where they historically did not go in the winter.

   Reasons:

   a. Increase in human populations that have an interest in winter recreation.
   b. Increase in winter recreation trends such as snowmobiling, skiing and snowshoeing.

3. Denning habitat is at the high end of what was available historically but still within the natural range. This is due to increased amounts of down woody material.

4. Adequate summer foraging habitat is available because there are more conifer seedlings (predominately subalpine fir) in the understory of the mature conifer stands. There are less aspen seedling stands than historically.

5. Red squirrel habitat is available in greater amounts due to the high amounts of mature conifer. It is still within the natural range.

6. Increased displacement and disturbance along travel corridors.
   Reasons:
   a. There is an increased amount of roads and trails along riparian corridors and ridges due to the increase in recreation. See recreation trends for more details on reasons for recreation demands.

7. Open non-forested areas used by other prey species have decreased in size.
   Reasons:
   a. Conifer encroachment in sage/grasslands and mountain brush complexes.
   b. Housing developments and agriculture operations have removed most of the sage/grasslands outside the forest boundary.
   c. See non-forested vegetation trend discussion for more details.

DFC for Wildlife Populations: Improve and maintain habitat for viable wildlife populations that will reflect natural patterns and distribution across the landscape. Habitat conditions contribute toward the recovery of threatened, endangered and sensitive species.

Recommendations for lynx populations:

- ✓ Causes for decline in populations of lynx are beyond our control. Increase education of hunters to reduce incidental take (trapping, hunting or chase season).
- ✓ Discourage development along drainages and major ridges.
- ✓ No net increase in snow compaction and try to decrease snow compaction by:
  1. No cross-country snowmobile travel, designate snowmobile routes and play areas.
  2. Trade current groomed trails for others that are not in sensitive areas.
  3. No new winter outfitter/guide permits in areas that are currently less used by people.
- ✓ Identify core lynx denning habitats. Provide security in and adjacent to old growth stands and denning habitat. Maintain these over the life of the vegetation.
- ✓ Maintain foraging habitat when planning other projects.
- ✓ Provide interconnected blocks of foraging habitat where snowmobile, crosscountry skiing and snowshoeing are minimized.
- ✓ Increase early seral aspen.
- ✓ Close Relay Ridge to motorized use because it is the main ridge in the area.
- ✓ Close Patterson Creek drainage to motorized use to improve security; it's a major drainage with denning and foraging habitat.

- ✓ Maintain North Fork of Packsaddle ridge, Milk Creek ridge, Dude Creek Ridge, Mount Manning Ridge, South Twin Creek Ridge, Dry Henderson Ridge and ridge between Coal Mine and Woods Canyon as undeveloped.
- ✓ Maintain nonforested habitats. Decrease successional conifers within these vegetation types.

The team designated the following areas of lynx habitat to be maintained or enhanced over time. See Map 18 for locations. These areas provide high security and quality denning habitat. Maintain these areas in mature and over-mature stands with high amounts of down woody material.

- ❖ Mount Manning
- ❖ High elevation area between Mahogany and Dry Fork of Henderson
- ❖ West portion of Maytag land and forest west of Maytag land
- ❖ South of Victor in the Snake River Range (if the trails become non-motorized)

Trends in Big Game Winter Range

1. Decrease in size of winter range

   Reasons:

   a. Increasing residential development along the perimeter of the Forest has reduced availability of winter range.
   b. Decrease in seral aspen due to conifer succession. Less aspen seedlings especially along the south facing slopes in lower elevations.

2. Decrease in browse availability.

   Reasons:

   a. See nonforested vegetation for trends mountain brush, mountain mahogany.
   b. Increase in deer populations in 1950's. Deer highlined the mahogany making it unavailable to big game.
   c. Less productive winter range due to mature age classes.
   d. Decrease in feed grounds for elk may increase competition with deer in the winter range.
   e. Gruell (1986) investigated changes in mule deer populations and habitats. He concluded that the succession of grasses to woody plants was the principal cause of mule deer population increases. The invasion of woody plants was set in motion by intensive grazing which suppressed or eliminated competing grasses and by a marked reduction in the size, intensity and frequency of fire, which had periodically eliminated and suppressed woody plants and had maintained ranges that were predominately bunchgrasses.
   f. An analysis of Big Hole winter range by Johnson and Keller (197?) found 3 basic types of vegetation. The sagebrush grass and mountain brush communities were showing a trend of moving from shrub to grass/forb communities. Mountain mahogany showed evidence of past heavy browsing and was unavailable to deer. The last type was Douglas-fir/Pachistima, which received heavy browsing use.

3. Increase in winter recreation use causing distrurbance and displacement of wintering animals.

   Reasons: see recreation discussion

4. Increase in number of complaints of elk damage on private land.
   Reasons:
   a. Hay predation (depredation) because elk have no other place to go.

DFC for Big Game Winter Range: Winter range forage is abundant, includes a mixture of grasses, forbs and shrubs and is well distributed throughout the area. Access is managed or restricted to provide security for wintering big game. This will encourage big game use on public land. Decrease detrimental interactions with humans on private lands.

Recommendations:

- ✓ Increase patch sizes of openings such as grasslands, sage/grasslands and brush fields.
- ✓ Priority for treatments are on lower elevations east and south slopes and ridgetops
- ✓ Encourage planting of good browse species on private land where wintering wildlife is welcome.
- ✓ Map sagebrush habitats, percent canopy cover and old burns. Consider distribution of seral stages and canopy cover before implementing more sagebrush burns.
- ✓ Mountain mahogany treatments need to be carefully planned and implemented to achieve objectives.
- ✓ Place and enforce seasonal closures (closed to all human use) to reduce access in winter range on public and private land.
- ✓ Place and enforce a date for antler collection that is not detrimental to wintering wildlife.
- ✓ Expand winter range closure areas (A) on winter travel map to cover the entire area from North Twin Creek to Patterson Creek and designate winter travel routes.
- ✓ Change winter use restrictions to all winter use and not just snowmobiles. Change "A" to "B" areas. This would restrict motorized and nonmotorized use to designated routes.
- ✓ See recommendations for nonforested and aspen vegetation.

Trends for Other Wildlife

1. Change in types of herbivores from bison and big horn sheep to domestic cows and sheep.

2. Decrease in security due to increase in roads and trails. Species preferring seclusion are now restricted to small, isolated security areas. An analysis of summer security (areas over ½ mile from an open motorized route) shows that only 19 percent of the watershed is providing secure summer habitat. These are found in small areas below Relay Ridge, Dude Creek, Mt. Manning/South Twin and the head of Mahogany.

3. Static trend in neotropical migrant species with a slight decrease in riparian shrub nesting species due to the decline in willows.

4. Providing more habitat for forest raptors due to the mature state of the forested vegetation.

5. The loss of stream connectivity to the Teton River has lead to a decrease in amphibian populations. This affects the riparian corridors value as a movement corridor, and creates isolated populations of species that don't make large movements (spotted frogs).

6. Decrease in predator populations. Wolves and grizzly bears are no longer in the watershed.

7. Increase in species and populations of species tolerant of humans such as fox, raccoons and skunks.

8. Decrease in beaver populations due to over-trapping and a decline in their primary food source, willows.

9. Increase in hiding cover for big game, reducing vulnerability during hunting season due to denser shrub cover and an increase in conifers in the grass, forb, and shrub vegetation communities.

10. Change has occurred in the valley since the late 1970's and early 1980's with the creation of subdivisions. These subdivisions have occurred from the valley bottom to the foothills adjacent to the public lands. Subdivisions can affect wildlife through a direct loss of habitat due to vegetation alteration and as barriers to movement as a result of human disturbances and associated pets. Identify private lands adjacent to the forest that are providing habitat and identify threats to these habitats.

11. As forest cover has increased over the last century, habitat for canopy nesters has increased.

12. Decrease in habitat for black-backed woodpeckers due to less large fires.

Recommendations for other wildlife species:

- ✓ Relocate beaver in Milk, Dude and South Fork Horseshoe Creeks. Modify trapping regulations with Idaho Fish and Game.
- ✓ Maintain security areas greater than ½ mile from motorized roads and trails around South Twin Creek, at the head of Mahogany Creek and create a security area in Patterson Creek and Pole Canyon/Smith Canyon area.
- ✓ Improve riparian habitats in Henderson, Dry Henderson, Grove and Patterson Creeks.
- ✓ Inventory Aligator and Lizzard Lakes for vegetation types, condition of vegetation and need for treatment.

Trends in Recreation

Social Trends

1. Our society has changed from one of privatization (1800 to 1891) to conservation and scientific management (1891 to 1945) to commodity production (1945 to 1970) to increasingly complex and contentious demands (1970 to present) (USDA Forest Service 1997).

2. Populations in Teton Valley have changed. The highest population was in 1920 and slowly declined until 1970 when the population began to again increase and is still increasing.

3. Change in attitude from a tight knit agriculture community to a service, technology based community where lots of "newcomers" are present.

4. Attitudes of society towards resources have changed from one of using resources to survive (conservation) to one of keeping the resources in tact forever (preservation). This has caused conflict in the local area between conservationists and preservationists. There is a County and State's rights movement in Teton Valley and the surrounding area.

5. Affluence has increased leading to many technology advances such as mechanized and motorized transportation.

6. Teton Valley's society has changed from promoting family attitudes and values to a mixed society of a younger more transient population and older ranching community.

7. There has been an increase in current and proposed housing developments leading to more demands on the Forest resources such as recreation and forest products.

Trend in Trail Use

Trail use has changed since reference condition in the following manner.

1. An increase in miles of trails.
2. A major increase in motorized use on the trails.
3. A decrease in solely non-motorized use.
4. A decrease in horse use.
5. An increase in mountain bike use.
6. An increase in snowmobile use.
7. An increase in hiking use.

Reasons for the above trends:

a. More trails were created through livestock use, increased demand for hunting and increased demand for more access.
b. Greater affluence and interest from populations outside of Teton Valley has lead to more people wanting to recreate in the Big Holes.
c. A change in technology (cars, highways) allows people from outside the Valley to get here faster and easier. Technology has also provided society with ATV's, motorcycles and bicycles that are adapted to the trail conditions.
d. An increase in Teton Valley population and a change in society's perception of consuming resources to one of enjoying the experience.
e. The crosscountry motorized policy that the forest had previously to the Revised Forest Plan permitted motorized use anywhere. This caused people to drive down the path of least resistance.

Trend in Trail Conditions

1. Trail conditions have deteriorated.

    Reasons:

    a. Lack of and decrease in maintenance.
    b. Lack of trail design for motorized use. Most of the trails were user created and not engineered for motorized use.

c. Increase use by all user groups.

2. Access to trails across private land has decreased.

Reasons:

a. Change in public attitude.
b. Increase in use; more recreationalists want to cross private land to access the trails causing some landowners to post their land for no trespassing.
c. Increase in destructive use probably due to lack of respect for land and ownership.
d. Smaller land parcels adjacent to the Forest. Farms have been subdivided.

Trends in Other Recreation Uses

1. Pine Creek Campground not adequate to meet recreational vehicle needs. Designed for tent campers. Facilities are degraded, outdated and in poor shape. No water system.

Reasons:

a. Shifts in society's attitude.
b. Greater affluence and interest from populations outside of Teton Valley has lead to more people wanting to recreate in the area.
c. A change in technology (cars, highways) allows people from outside the Valley to get here faster and easier. Technology has also provided society with bigger and different types of campers rather than tents.
d. An increase in Teton Valley population and a change in society's perception of using the resource to one of enjoying the experience.

2. More dispersed camping. The type of dispersed camping has also changed from horses and pack strings to trucks, trailers and ATV camps.

Reasons:

a. Shift in society's attitude from one of consuming resources to one of enjoying the experience.
b. Greater affluence and interest from populations outside of Teton Valley has lead to more people wanting to recreate in the area.
c. A change in technology (cars, highways) allows people from outside the Valley to get here faster and easier. Technology has also provided society with various methods of camping and recreating.
d. Increase in roads and trails providing more access and opportunities.
e. Increase in human population.
f. Increase in fees for developed campgrounds.

3. Types of outfitter-guides have changed from hunting to day hikes and snowmobile trips.

Reasons:

a. Shift in society's attitude from one of using the resource to one of enjoying the experience.
b. Greater affluence and interest from populations outside of Teton Valley has lead to more people wanting to recreate in the area.
c. Decrease in big game herds.

DFC for Recreation: Provide a variety of recreational opportunities with emphasis on motorized recreation. Resource protection will be accomplished by restricting motorized use to selected and designated routes. Trails and roads should be sufficient to sustain use over long periods of time and minimize requirements for maintenance and construction.

Recommendations:

- ✓ Do not add any more miles of trails because the Forest can't maintain existing trails.
- ✓ Change types of use on some trails to protect resources or to provide a nonmotorized experience.
- ✓ Inventory nonsystem trails.
- ✓ To ensure motorized vehicles do not use nonsystem trails and system trails designated for nonmotorized use, enforce the closure order; sign as closed to motorized use, obliterate trails, inform users of the change and impacts of motorized use.
- ✓ Inventory trail conditions, accomplishing 10 percent per year.
- ✓ Maintain trails.
- ✓ Relocate trails that are difficult to maintain or are located in landslide prone areas.
- ✓ Reconstruct selected trails to meet specifications for ATV's and motorcycles.
- ✓ Close trails where resource protection is not possible
- ✓ Develop trailheads at the end of Sherman Springs road (913) and Pole Canyon road (547).
- ✓ Obtain right-of-way easements for all trails.
- ✓ In Pine Creek campground, provide pads and roads to meet RV needs. Don't expand the site. Mike Harris and Trail Creek are near by that could provide additional RV opportunities. Upgrade the facilities and fix the leaking toilet vault.
- ✓ Additional developed campgrounds are not needed at this time. As populations increase and recreational users increase more campgrounds may be needed. One suggested area for a future campground would be on the north end of the Big Holes.
- ✓ Monitor impacts of dispersed camping to soil, water and fish.
- ✓ Apply management prescription 4.3 on the dispersed sites located on Packsaddle/ Horseshoe Loop Road, Packsaddle Lake and Packsaddle Springs. This would facilitate management of these sites.
- ✓ Inventory all dispersed sites in the watershed.
- ✓ Monitor time of use to determine if dispersed sites are used seasonally.
- ✓ Educate users about management objectives.
- ✓ Harden dispersed sites. Define boundaries around sites to contain them in one area.
- ✓ Packsaddle Lake is the first priority for dispersed camping inventory and management.
- ✓ Enhance parking at the end of road 207 to prevent more trucks driving down to Packsaddle Lake.
- ✓ Restrict motorized use on trail to Packsaddle Lake (north section of trail 212) that starts at the end of road 381. Stop erosion and provide drainage on this trail.
- ✓ Eliminate camping at Packsaddle Lake. Allow only day use.
- ✓ Keep cattle out of Packsaddle Lake.
- ✓ There are opportunities for more outfitter/guides in the Big Holes. More opportunities for nature hiking permits than big game hunting permits.
- ✓ Perform an outfitter/guide capacity study in 7-10 years.
- ✓ Enforce and monitor outfitter/guide permits.

- ✓ Seasonal closure for motorized use on trails from the time the winter travel plan is no longer in effect until July 1 to prevent damage to the trails such as rutting, erosion. The seasonal closure would provide security for elk calving; maintain water quality; and provide a non-motorized opportunity in the Big Holes. The fall seasonal closure date was debated amongst the team members. We are trying to protect trails from use during the wet season and in the fall duration and timing of the wet season is variable. Education of users is more appropriate for the fall. Closure in the fall is not warranted for the big game hunt. Winter weather conditions will close the trails.

Recommended Trail System

The team focused on recommending an ATV trail system in the Big Holes as most of the trails are already designated motorized. ATV use is increasing and not every trail can accommodate an ATV. See Map 19 for recommended trail locations. Generally, the trails and soils (highly erodable) in the analysis area are not suitable for ATV use but opportunities should be provided where possible due to the increase in this recreational activity. One of the suggestions was to use decommissioned or two track roads for ATV's since the tread is wide. Assumptions made concerning the recommendations: ATV users prefer loop trails and most of the ATV use is during hunting season. The entire Big Hole trail system was considered so that opportunities were connected.

South Portion of the Watershed

The Powerline Road (031) would be the ATV route. Opportunities will be considered to connect the entire portion of Powerline road between Pole and Smith Canyons. Recommend Pole Canyon (174), Smith Canyon (052), Murphy Creek (014) and Blanchard Creek (081) trails closed to all motorized use. This would provide an opportunity for non-motorized use in a portion of the watershed that is adjacent to non-motorized trails in the Palisades Wilderness Study Area and adjacent to a development promoting non-motorized activities on private land. This would provide a secure area for wildlife such as big game and lynx, remove motorized use from trails located in AIZ's, improve water quality in WQL streams, and decrease the chance for soil erosion on the trails.

Dry Henderson to Pine Creek Pass Highway

Propose an ATV trail from Pine Creek Pass Highway along the Big Hole Crest Trail (079 & 053) to Dry Henderson Trail (070). A trailhead would be built across from Murphy Creek road (909) for parking and re-route the Big Hole Crest Trail to this point. This would provide a safe place for vehicles to park and prevent crossing the highway with ATV's. An ATV trail would be constructed in Drake Creek. The trail (073) in the bottom of Drake Creek would become non-motorized and a new trail would be developed for motorized use on the ridge where a non-system trail currently exists. This would decrease further degradation of the trail in the riparian area and decrease the sediment entering Drake Creek. This would provide an ATV loop opportunity.

Maintain Mahogany trail (057) for motorcycles only. There are erosion problems on this trail and it would be difficult to build it to ATV standards due to the extra width required.

Nickerson Grove (195) would become an ATV trail. It is already a two track road and is relatively flat. A loop opportunity is possible if county roads are used.

Middle Twin (069) to Elk Flat, west to trails 056 and 066 would become an ATV trail. This would provide ATV access from Teton Valley to Elk Flat and connect to the 051 ATV trail.

Any Forest road designated open to motorized use can be used by street legal ATV's. Opportunities for this exist in the Big Holes. In the Dude Creek area, inside Horseshoe/Packsaddle Loop road, are several opportunities for ATV use when the seasonal closures on the roads are lifted. The roads in the north end of the Big Holes would provide additional ATV opportunities.

ATV's would not be permitted on the trail into Packsaddle Lake to prevent further damage to the lakeshore. Provide parking areas on the south end above the lake so ATV riders could walk to the lake.

Carlton Cutoff trail (060) from the Grandview Guard Station to Relay Ridge Road would be an ATV trail. It already is a two track road and would provide ATV access to the roads in the north end of the Big Holes.

Trend in Road Use and Condition

Road use and condition has changed since reference condition in the following manner.

1. Increase in numbers of roads

   Reasons:

   a. Shift in society's attitude from one of consuming resources to one of enjoying the experience.
   b. Greater affluence and interest from populations outside of Teton Valley has lead to more people wanting to recreate in the area.
   c. A change in technology (cars, highways) allows people from outside the Valley to get here faster and easier. Technology has also provided society with vehicles capable of driving in the mountains.
   d. .Public's desire for increased access.
   e. Increase in and aging of the population that want motorized access to all areas.

2. Road conditions have degraded. Six roads in the watershed were engineered or designed and the rest are user created.

   Reasons:

   a. No maintenance.
   b. Improper placement and lack of design.
   c. Increased use by all user groups.
   d. Lack of funding.
   e. Change in use from full size pickups to ATV's because road conditions allow only ATV's.

3. Change in use from winter logging and horses to motorized, summer logging.

Reasons:

a. Shift in society's attitude. People wanted to earn a livelihood from logging.
b. Advances in technology provided more mechanized logging equipment and economic incentives to log differently.

4. Shift from user created roads to designed roads. Roads were built or used following the path of least resistance during early settlement. As technology advanced, so did road construction techniques allowing roads to be built almost anywhere as long as it was economically feasible.

Reasons:

a. Began designing roads because of resource concerns.
b. Designed roads so modern logging equipment could be used.

5. Decrease in maintenance. No maintenance on user created roads and very little maintenance on designed roads after completion of timber sales.

Reasons:

a. Improper placement and lack of design.
b. Increased use by all user groups.
c. Lack of funding.

6. Access to Forest across private property has decreased.

Reasons:

a. Change in public attitude. More "tourists and newcomers" are accessing the Forest and private landowners are posting their land with no trespassing signs. It is no longer your neighbor using the access.
b. Increase in use.
c. Increase in destructive use probably due to lack of respect for land and ownership.
d. Smaller land parcels adjacent to the Forest. Agriculture land has been subdivided.
e. County has failed to file proper access.
f. Forest Service failed to maintain legal access (land exchange, Patterson Road).

DFC for Roads: Same as recreation above.

Recommendations:

- ✓ Obliterate nonsystem roads because they are not maintained and will not sustain use over time.
- ✓ Do not add any new system roads. Maintain or reduce current road densitites.
- ✓ The following recommendations pertain to roads in Grove, Patterson, Henderson and Dry Henderson Creeks.
    1. Move roads out of the AIZs
    2. Fix all drainage problems associated with each road.
    3. Turn current roads into a motorized trail at the Forest Boundary.
    4. Provide parking at Forest boundary.
    5. Obtain access right of ways.
- ✓ The following recommendations pertain to the road in Mahogany Creek.
    1. Move road back to Forest boundary and provide parking.

2. Gate road from Forest boundary to headgate to allow water permittee access.

- ✓ Horseshoe-Packsaddle Road – Obliterate road. Re-engineer to remove the road from the slumps and AIZ. Install wire cages filled with rock to hold slumps. Provide drainage into slope to get water off of slump.
- ✓ Roads north of Packsaddle Creek – Re-engineer to get proper sloping. Surface the roads. Make the roads into motorized trails not to be used by trucks and cars.

PRIORITIES

The team chose three priority areas to focus management opportunities for the next five years. The areas are not in any order of priority. The areas were chosen because they have a variety of opportunities. See Map 20 for locations.

Dry Henderson to Patterson. This area had the most resource concerns associated with it.

- Treatments in mature aspen and mountain mahogany stands.
- Riparian improvements needed in Henderson, Dry Henderson and Patterson.
- Roads to close and trails to maintain, winter range to be maintained or improved.
- Lynx security and denning habitat to be enhanced or maintained.
- Verify and maintain old growth.
- Adjacent to urban interface.

Horseshoe Creek. Opportunities in this area would benefit cutthroat trout.

- Close non-system roads and trails to motorized use.
- Improve system roads, inventory mines and determine if contributing to degradation of water quality.
- Inventory beaver populations and re-introduce beaver.

South end of the watershed in the Snake River Range. This area is expected to have increased recreational use due to the Teton Springs Development proposed on adjacent land.

- Improve conditions on WQL streams.
- Get trails to standards that can withstand the expected increase in use.
- Improve and inventory winter range.
- Treat forested and non forested vegetation to move towards DFC.
- Treat mature aspen.
- Provide fuelwood and forest products.

CHAPTER 5 – DATA GAPS

During the analysis process, the Team identified areas where data is missing. A list follows; it is not in an order of priority. Data should be collected when opportunity arises.

1. Mature and old growth Douglas fir and aspen stands may provide suitable nesting habitat for flammulated owls. Furthur surveys should focus on these areas of suitable habitat. Aspen areas to be surveyed are in North and South Twin and Patterson Creeks, but priorities are Mahogany and Drake Creeks. For Douglas-fir areas, Dry Hollow and Mahogany Creeks could be surveyed, but priorities are Grandview area and Mahogany to Dry Fork along the Forest Boundary.

2. Field review of identified lynx denning habitat in security areas to assess actual habitat conditions.

3. Spotted frog surveys should focus on Dude Creek and Milk Creek. These areas have been identified as suitable for beaver relocation.

4. Bitterbrush browse transects are located on Horseshoe Canyon and Blanchard Ridge in the watershed. It looks like the Horseshoe Canyon area was burned in 1978-80 and the transect was last reread in 1990. If these transects can be relocated, they should be reread.

5. There were several aspen treatments from the 1980's, especially in the Mahogany drainage. Monitoring to evaluate the response of different treatment methods (burning, clearcutting and bulldozing) would be beneficial in identifying future treatment methods.

6. Inventory unoccupied but suitable drainages for beaver. Resurvey Horseshoe Creek for beaver occupancy. Work with Doug Peterson, IDFG, on relocation of problem beavers into identified drainages.

7. Map sagebrush habitats, percent canopy cover and old burns. Consider distribution of seral stages, canopy cover before implementing more sagebrush burns. These are mostly on north end, Packsaddle and Rammell Hollow.

8. Begin old growth verification process, focusing on old growth blocks identified during this process.

9. Inventory fish habitat, collect sediment data and comparative fish population data for trend analysis.

10. Inventory dispersed camp sites.

11. Conduct trail condition surveys.

12. Inventory of non-system trails.

13. Inventory nonsystem roads. Collect data on location, length and condition.

14. Map current aspen stands and historic aspen stands using 1995 and 1943 air photos. Compare these results to determine historic aspen patch size and location.

15. Conduct stream channel and condition surveys.

CHAPTER 6
LIST OF PREPARERS

David Betz, Caribou - Targhee National Forest Fire Ecologist

Robert Boyles, Teton Basin Ranger District GIS Specialist

Kraig Carrol, Palisades Ranger District Fuels Specialist

Liz Davy, Teton Basin and Palisades District Silviculturist

Betsy Hamann, Caribou National Forest Wildlife Biologist

John Hamann, Targhee National Forest Soil Scientist

Kurt Kluegel, Teton Basin Ranger District Trails Technician

Lee Mabey, Caribou - Targhee National Forest Fisheries Biologist

David Ovard, Teton Basin Ranger District Natural Resource Technician

Robert Specht, Teton Basin Ranger District Natural Resource Specialist

JC Stimpson, Teton Basin Ranger District Range Technician